COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF TELECOMMUNICATIONS AND ENERGY

FITCHBURG GAS AND ELECTRIC LIGHT COMPANY
2003 INTEGRATED GAS RESOURCE PLAN
Docket No. D.T.E. 03-52

COMPANY'S RESPONSES TO THE DEPARTMENT'S RECORD REQUESTS
January 22, 2004 Hearing

DTE-RR-1 Please provide the costs associated with obtaining actual 2002 data for the independent variables from Global Insights and the additional time it would have taken to include the actual data in the 2003 IRP.

Company Response:

Referring to the list of variables provided in response to DTE-RR-2, it is important to note that historical actual data for different types of data become available at different times. For instance, as of January 2004, retail natural gas prices are available through August 2003; retail oil prices and retail electricity prices are available through September 2003. Thus historic energy price actual data are typically available four to five months after the period ends. The county level data for 2002 were published in the fall of 2003, which reflects the normal publishing schedule for such data. The state level data for 2002 will not be available until December 2004, although the normal publishing schedule would have provided for publication in June 2004. To summarize, as of August 2003, when work began on the update of the 2003 Integrated Gas Resource Plan ("IRP"), the only actual data for 2002 available were the energy price data. Thus, the timing of the availability of comprehensive actual data for 2002 was more of a concern than the time it may have taken to gather, process and incorporate the data into the updated IRP.

Global has indicated that they would have strongly advised FG&E to repurchase the entire history and forecast package rather than to simply update the actual data for 2002, which as discussed above were not available for the majority of the variables sought. While repurchasing an updated forecast may have provided more current forecast data for the period of 2002 through 2007, FG&E considered this at the time of the update and determined that, since the refiling of the IRP was scheduled to be made only five months after the original filing, using the original historic / forecast data obtained from Global Insight, which had an annual frequency, was reasonable and cost effective in terms of any expected impact on the requirements assessment.

With regard to cost, Global Insight has indicated it would have charged the same price for the updated forecast data as originally charged plus three percent. The amount charged is listed under "Professional Data Services" in response to DTE-RR-10 (Confidential).

Person Responsible: Robert S. Furino

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DTE-RR-2 Please provide a list of the independent variables provided by Global Insights and the forecasting methodologies utilized by Global Insights in forecasting these variables.

Company Response:

Listed below are the economic, demographic and energy price data FG&E obtained from Global Insight for potential use as independent variables in the various equations utilized in the Resource Requirements section of the IRP. Also listed are CPI and PPI, which were used to adjust nominal currency data as appropriate. Including the two inflation series, the list includes 18 variables that were provided in response to DTE-2-30 (Confidential). The list also includes 7 variables that were evaluated but not found to be useful in performing the analysis.

The forecasting methodologies utilized by Global Insight in forecasting the listed variables are described in terms of Global Insight's inter-related modeling systems, including their Economic Modeling System, their US Energy Modeling System and their Regional Economic Modeling System. Three documents which describe these modeling systems are attached as DTE-RR-2-A, DTE-RR-2-B and DTE-RR-2-C.

Data provided by Global Insights

SERIES DESCRIPTION	TYPE	REGION	UNITS	CURRENCY
CPI (CPI-U)	INFLATION	US	index	Base = $2000
PPI	INFLATION	US	index	Base = $2000
Price of #2 Home Fuel Oil	ENERGY	Mass	cts/gal	Nom$
Price of #6 Oil	ENERGY	Mass	cts/gal	Nom$
Price of Residential Gas	ENERGY	Mass	$/mmbtu	Nom$
Price of Commercial Gas	ENERGY	Mass	$/mmbtu	Nom$
Price of Industrial Gas	ENERGY	Mass	$/mmbtu	Nom$
Population	COUNTY	Wor	persons	na
Housing Starts	COUNTY	Wor	units	na

Response to DTE-RR-2 (cont.)

SERIES DESCRIPTION (con't)	TYPE	REGION	UNITS	CURRENCY
Housing Stock	COUNTY	Wor	units	Na
Households	COUNTY	Wor	units	Na
Size of Household	COUNTY	Wor	persons	na
Disposable Income	COUNTY	Wor	million	Nom$
Disposable Income/Capita	COUNTY	Wor	$000 per	Nom$
Nonmanufacturing Employment	COUNTY	Wor	000's	na
Service Employment	COUNTY	Wor	000's	na
Manufacturing Employment	COUNTY	Wor	000's	na
Output	COUNTY	Wor	million	Nom$
Personal Income	COUNTY	Wor	million	Nom$
Wage Rate - Nonag. Employment	COUNTY	Wor	dollars	Nom$
Gross State Product	STATE	Mass	million	1996$
Industrial Production (1992=1.00)	STATE	Mass	index	na
Price of Residential Electricity	ENERGY	Mass	$/mmbtu	Nom$
Price of Commercial Electricity	ENERGY	Mass	$/mmbtu	Nom$
Price of Industrial Electricity	ENERGY	Mass	$/mmbtu	Nom$

Person Responsible: Robert S. Furino

ECONOMIC MODELING SYSTEM
FOR STATES, COUNTIES AND ZIP CODES

Global Insight's county level and above forecasts are developed using current and historical data, as well as economic modeling techniques. This process enhances economic analysis in two important ways. First, it utilizes all current data and information to accurately estimate the current location of employment, establishments, and output. Second, it defines the relationships between each variable and the appropriate economic, cyclical, and migratory factors that cause their movements over time.

The model estimation process incorporates the effects of the business cycle on employment trends and, therefore, yields much more accurate forecasts at the county level and above. The estimated relationships are used to develop estimates for the current year and forecasts for each of the next five years that reflect Global Insight's widely-used Regional, State, County and Zip-Code Economic Forecasts.

Our county level and above forecasts are based on information which is updated quarterly in the context of Global Insight's international network of large-scale economic models. This accurately depicts changes in worldwide, domestic, state, and local economic activity. In this context, the estimates and forecasts account for changes in international, national, state, and local economic conditions and not merely the trends embodied in past censuses.

Global Insight's approach to county, state, and national demographic forecasting models represents a significant departure from most previous detailed-geography modeling and forecasting efforts which use only classical demographic modeling techniques. Most other models are constructed as extrapolated trends of the decennial census data and proportions of the United States totals. In the Global Insight system, however, each area is modeled both individually and linked to its respective county, metropolitan area, state, and national modeling system. Thus, the models do not forecast local and regional growth as simple trends and proportions of U.S. totals, but focus on internal economic growth dynamics, differential business cycle responses, and variable migration patterns. This approach is referred to as a top-down bottom-up model. It contrasts sharply with pure national/regional share (top-down) models and models which are not linked to a national/regional economic models at all (bottom-up). It contains the best of both approaches.

The basic objective is to forecast local/regional activity in the context of a reliable, consistent, comprehensive, and detailed economic environment provided by Global Insight's U.S. Economic, Industry Analysis, and Regional Forecasting Models. To do this, two key phenomena must be explained:

- Why local economic and demographic factors behave differently across geographic areas in the short term over the business cycle.

- Why local economic and demographic factors grow or decline relative to each other across geographic areas over the longer run.

These issues are addressed using detailed, consistent data and information about the local industrial mix, interindustry and interregional relationships, productivity and relative business costs, cost of living and quality of life, wage and income patterns, and migration trends.

The State, Metropolitan Statistical Area (MSA), and County models are econometric in nature, incorporating underlying behavioral relationships between such concepts as income and jobs, population and jobs, household formation and housing starts, migration trends and life cycle realities, and total wealth and types of income. The linkages at all levels to local behavioral factors and regional/national economic factors leads to greater accuracy and complete consistency. Consequently, each model captures the full business cycle behavior of the economy, including the timing and amplitude of the turning points and reflecting the disparities that exist across states, counties, and local areas.

Another general characteristic of the models is that they are policy sensitive: they respond to changes in tax rates, military spending, utility costs, and other exogenous factors. There are a number of reasons for this sensitivity:

- Each area is modeled individually, with different model structures specified according to the characteristics of the area.

- National policy is explicitly captured and uniquely impacts each area.

- The comparative advantage of one area over another is explicitly modeled using industrial mix, relative costs, job opportunities, quality of life factors, and climatic conditions.

The three major components of the Global Insight approach to regional, state, MSA, and county geo-demographic forecasting are summarized below.

The major linkages among the models across geographic areas and at different levels of aggregation occur in the **economic base** or **export** sectors. (Export refers not only to shipments out of the country but also to shipments from the state or locality to other parts of the country.) These include primarily agriculture, mining, the federal government, and most manufacturing industries. In a few local economies, banking, insurance, or services (e.g., hotels) sectors are also classified as export sectors. For the most part, these industries serve national rather than local markets or are not dependent upon the local market. On the other hand, the income generated from these sectors provides one of the major stimuli to the local economy. The local growth and decline of these sectors helps determine the economic health of the area and its attractiveness to individuals, families, and households.

The **local economy** is composed of construction, transportation, utilities, communications, finance, insurance, real estate, wholesale and retail trade, services, and state and local government. The major driving forces in this part of the each area's economy are local in nature. The income generated by the export sectors circulates and multiplies through the local economy and generates the greater part of regional employment. These interactions and simultaneities can only be captured in an independent model. These factors further characterize economic activity and affect migration decisions of individuals, families, and households.

In the **demographic sector**, net migration is driven by economic conditions. The principal assumption here is that people follow jobs and higher incomes rather than vice-versa. This does not mean that nonpecuniary determinants of migration do not exist. However, these are either fixed (climate and landscape), vary only slowly (urbanization and life cycle factors) or are special in nature (the ability to sell homes and retire to Sunbelt areas). Demographic factors significantly impact the consumption side of the regional, state, and local economy. They significantly affect housing, retail sales, autos, personal services, education, and health care. Population, number of households, income, and wealth are also an important long-term determinant of the size of such sectors as state and local government.

COUNTY AND ZIP CODE FORECASTS

Detailed county level data for employment and establishments are available from a number of government sources. Data provided by County Business Patterns (CBP) data published by the Bureau of the Census, Bureau of Labor Statistics, Bureau of the Census and data provided by Business Facts, serves as the basis for this analysis. The database covers all businesses with one or more paid employees. Farm and government employment are based on the 1992 Census of Agriculture and the Bureau of Labor Statistics (BLS), respectively.

To ensure consistency between county level forecasts and Global Insight's national, state and metropolitan area forecasts, we first created a county level historical database that was internally consistent throughout the entire time period under consideration (1980-1998). To do this we first recalculated the national level government data so that data before 1992 was consistent with the 1992 SIC code redefinition. This provides us with a database from which to infer forecast trends and insures that outlying data will not unduly influence the forecast outcome.

From this base we are able to estimate county employment trends on a county by county basis. The trend estimated by this procedure is independent of any state or national level forecast. By combining this independent trend analysis with Global Insight's state and metropolitan area forecast we are able to estimate a unique growth path for each of the nation's 3,141 counties. Due to the fact that the government data for MSAs is collected independent of the CBP data used for our first estimate of county employment, estimated employment differs from the metro area count by several percentage points. To correct

for this bias and maintain consistency not only between our state and county estimates, but also with our MSA forecasts, an iterative process was used to isolate the county level employment combination that satisfies all three employment estimates.

Data provided by Business Facts for 1998 serves as the benchmark for the final forecast at the county level. To achieve this the growth estimates calculated above were applied to 1998 levels provided by Business Facts to calculate the final forecast levels. To estimate Zip Code level employment and establishments, data provided by Business Facts for 1998 was incorporated to provide growth differentials between Zip Codes within a county. First a one year growth rate was established using only Business Facts data, then all of the Zip Code growth rates within a county for each industry were normalized about the mean growth rate for that county and that industry. These normalized growth rates were then used to adjust the county level growth rate for each observation within that county. The universe of observations is defined by the Business Facts benchmark data, only those state, county (or Zip Code), SIC code combinations that appear in the Business Facts database are represented in the final report.

Output forecasts were also prepared using national level data estimated using the revised 1992 benchmark input-output tables, with the exception of the wholesale and retail trade sectors. The input-output table measures industry sales valued at producer prices, which exclude transaction costs (transportation costs and wholesale and retail trade margins), but include excise taxes collected and paid by the producers. For this study, wholesale and retail output is measured as gross sales as measured by the Bureau of Census.

To arrive at output estimates at the county and Zip Code levels, we were first required to convert the government I/O codes to 4-digit SIC codes. This process involves the creation of a "mapping file" which correlates I/O codes to SIC codes, this file will be provided in hardcopy form, but is already incorporated in the final datasets and may be compiled by summarizing county or Zip Code output data by SIC code (for every I/O code there will be at least one 4-digit SIC code).

Once output has been matched to a SIC code, detailed national level SIC code data is calculated by allocating output using employment as an indicator of where and when production occurs. This yields national level estimates for output by 4-digit SIC. These estimates are then allocated to the counties and Zip Codes once again using employment as a proxy for production.

SIC	DESCRIPTION
0200	LIVESTOCK FARMING
0711	SOIL PREPARATION SERVICES
0720	CROP SERVICES
0740	VETERINARY SERVICES
0750	ANIMAL SERVICES, EXC VETERINAR
0761	FARM LABOR CONTRACTORS
0762	FARM MANAGEMENT SERVICES
0780	LANDSCAPE COUNSELING, PLANNING
0800	FORESTRY
0900	FISHING, HUNTING AND TRAPPING
1011	IRON ORES
1021	COPPER ORES
1031	LEAD & ZINC ORES
1041	GOLD ORES
1044	SILVER ORES
1061	FERROALLOY ORES, EXC VANADIUM
1081	METAL MINING SERVICES
1094	URANIUM-RADIUM-VANADIUM ORES
1099	METAL ORES NEC
1221	BITUM COAL, LIGNIT SRFC MINING
1222	BITUM COAL UNDERGROUND MINING
1231	ANTHRACITE MINING
1241	COAL MINING SERVICES
1311	CRUDE PETROLEUM & NATURAL GAS
1321	NATURAL GAS LIQUIDS
1381	OIL & GAS WELL DRILLING
1382	OIL & GAS EXPLORATION SERVICES
1389	OIL & GAS FIELD SERVICES NEC
1411	DIMENSION STONE
1422	CRUSHED & BROKEN LIMESTONE
1423	CRUSHED & BROKEN GRANITE
1429	CRUSHED & BROKEN STONE NEC
1442	CONSTRUCTION SAND & GRAVEL
1446	INDUSTRIAL SAND
1455	KAOLIN & BALL CLAY
1459	CLAY & RELATED MINERALS NEC
1474	POTASH, SODA & BORATE MINERALS
1475	PHOSPHATE ROCK
1479	CHEMICAL, FERTILIZR MINING NEC
1481	NONMETALLIC MINERALS SERVICES
1499	MISC NONMETALLIC MINERALS
1511	GENERAL BUILDING CONTRACTORS
1531	OPERATIVE BUILDERS
1611	HIGHWAY & STREET CONSTRUCTION
1620	HEAVY CONSTRUCTION, EXC HWY
1711	PLUMBING, HEATING, AIR-CONDTNG
1721	PAINTING & PAPER HANGING
1731	ELECTRICAL WORK
1741	MASONRY & OTHER STONE WORK
1742	PLASTERING, DRYWALL & INSULATN
1743	TERRAZZO, TILE, MARBLE WORK
1751	CARPENTRY WORK
1752	FLOOR LAYING & FLOOR WORK NEC
1761	ROOFING, SIDING, SHT METALWRK
1771	CONCRETE WORK
1781	WATER WELL DRILLING
1791	STRUCTURAL STEEL ERECTION
1793	GLASS & GLAZING WORK
1794	EXCAVATION WORK
1795	WRECKING & DEMOLITION WORK
1796	BLDG EQUIPT INSTALLATION NEC
1799	SPECIAL TRADE CONTRACTORS NEC
2011	MEAT PACKING PLANTS
2013	SAUSAGES & OTHR PREPARED MEATS
2015	POULTRY SLAUGHTER & PROCESSING
2021	CREAMERY BUTTER
2022	NATURAL & PROCESSED CHEESE
SIC	DESCRIPTION
2023	DRY, CONDENSD, EVAP DAIRY PDTS
2024	ICE CREAM & FROZEN DESSERTS
2026	FLUID MILK
2032	CANNED SPECIALTIES
2033	CANNED FRUITS & VEGETABLES
2034	DEHYD FRUITS, VEGETABLS, SOUPS
2035	PICKLS, SAUCES, SALAD DRESSNGS
2037	FROZEN FRUITS & VEGETABLES
2038	FROZEN SPECIALTIES NEC
2041	FLOUR & OTHER GRAIN MILL PDTS
2043	CEREAL BREAKFAST FOODS
2044	RICE MILLING
2045	PREPARED FLOUR MIXES & DOUGHS
2046	WET CORN MILLING
2047	DOG & CAT FOOD

2048 PREPARED ANIMAL FEEDS NEC
2051 BREAD, CAKE & RELATED PDTS
2052 COOKIES & CRACKERS
2053 FROZEN BAKERY PDTS, EXC BREAD
2061 CANE SUGAR, EXCEPT REFINING
2062 CANE SUGAR REFINING
2063 BEET SUGAR
2064 CANDY & OTH CONFECTIONERY PDTS
2066 CHOCOLATE & COCOA PRODUCTS
2067 CHEWING GUM
2068 SALTED & ROASTED NUTS & SEEDS
2074 COTTONSEED OIL MILLS
2075 SOYBEAN OIL MILLS
2076 VEGETABLE OIL MILLS NEC
2077 ANIMAL & MARINE FATS & OILS
2079 EDIBLE FATS & OILS NEC
2082 MALT BEVERAGES
2083 MALT
2084 WINES, BRANDY & BRANDY SPIRITS
2085 DISTILLED & BLENDED LIQUORS
2086 BOTTLED & CANNED SOFT DRINKS
2087 FLAVORING EXTRACTS, SYRUPS NEC
2091 CANNED & CURED FISH & SEAFOODS
2092 FRESH OR FROZEN PREPARED FISH
2095 ROASTED COFFEE
2096 POTATO CHIPS & SIMILAR SNACKS
2097 MANUFACTURED ICE
2098 MACARONI, SPAGHETTI & NOODLES
2099 FOOD PREPARATIONS NEC
2111 CIGARETTES
2121 CIGARS
2131 CHEWING & SMOKING TOBACCO
2141 TOBACCO STEMMING & REDRYING
2211 BROADWOVEN COTTON MILLS
2221 BROADWOVEN MANMADE FIBER MILLS
2231 BROADWOVEN WOOL MILLS
2241 NARROW FABRIC MILLS
2251 WOMENS HOSIERY, EXCEPT SOCKS
2252 HOSIERY NEC
2253 KNIT OUTERWEAR MILLS
2254 KNIT UNDRWEAR, NIGHTWEAR MILLS
2257 WEFT KNIT FABRIC MILLS
2258 LACE & WARP KNIT FABRIC MILLS
2259 KNITTING MILLS NEC
2261 COTTON FINISHING PLANTS
2262 MANMADE FIBER FINISHING PLANTS
2269 FINISHING PLANTS NEC
2273 CARPETS & RUGS
2281 YARN SPINNING MILLS
2282 YARN THROWING & WINDING MILLS
2284 THREAD MILLS
2295 COATED FABRICS, NOT RUBBERIZED

SIC DESCRIPTION

2296 TIRE CORD & FABRICS
2297 NONWOVEN FABRICS
2298 CORDAGE & TWINE
2299 TEXTILE GOODS NEC
2311 MEN'S & BOYS' SUITS & COATS
2321 MEN'S & BOYS' SHIRTS
2322 MEN'S & BOYS' UNDERWEAR
2323 MEN'S & BOYS' NECKWEAR
2325 MEN'S & BOYS' TROUSERS, SLACKS
2326 MEN'S & BOYS' WORK CLOTHING
2329 MEN'S & BOYS' CLOTHING NEC
2331 WOMEN'S, MISS' BLOUSES, SHIRTS
2335 WOMEN'S, MISSES', JRS' DRESSES
2337 WOMEN'S, MISSES' SUITS & COATS
2339 WOMEN'S, MISSES' OUTERWEAR NEC
2341 WOMEN'S & CHILDREN'S UNDERWEAR
2342 BRAS, GIRDLES, ALLIED GARMENTS
2353 HATS, CAPS, & MILLINERY
2361 GIRLS', CHLDN'S DRESS, BLOUSES
2369 GIRLS', CHILDN'S OUTERWEAR NEC
2371 FUR GOODS
2381 FABRIC DRESS & WORK GLOVES
2384 ROBES & DRESSING GOWNS
2385 WATERPROOF OUTERWEAR
2386 LEATHER & SHEEP-LINED CLOTHING
2387 APPAREL BELTS
2389 APPAREL & ACCESSORIES NEC
2391 CURTAINS & DRAPERIES
2392 HOUSEFURNISHINGS NEC
2393 TEXTILE BAGS
2394 CANVAS & RELATED PRODUCTS

2395 PLEATING, STITCHING & TUCKING
2396 AUTOMOTIVE & APPAREL TRIMMINGS
2397 SCHIFFLI MACHINE EMBROIDERIES
2399 FABRICATED TEXTILE PDTS NEC
2411 LOGGING
2421 SAWMILLS, PLANING MILLS - GENL
2426 HARDWD DIMENS & FLOORING MILLS
2429 SPECIAL PRODUCT SAWMILLS NEC
2431 MILLWORK
2434 WOOD KITCHEN CABINETS
2435 HARDWOOD VENEER & PLYWOOD
2436 SOFTWOOD VENEER & PLYWOOD
2439 STRUCTURAL WOOD MEMBERS NEC
2441 NAILED WOOD BOXES & SHOOK
2448 WOOD PALLETS & SKIDS
2449 WOOD CONTAINERS NEC
2451 MOBILE HOMES
2452 PREFABRICATED WOOD BUILDINGS
2491 WOOD PRESERVING
2493 RECONSTITUTED WOOD PRODUCTS
2499 WOOD PRODUCTS NEC
2511 WOOD HOUSEHOLD FURNITURE
2512 UPHOLSTERD HOUSEHOLD FURNITURE
2514 METAL HOUSEHOLD FURNITURE
2515 MATTRESSES & BEDSPRINGS
2517 WOOD TV & RADIO CABINETS
2519 HOUSEHOLD FURNITURE NEC
2521 WOOD OFFICE FURNITURE
2522 OFFICE FURNITURE, EXCEPT WOOD
2531 PUBLIC BLDG & RELATD FURNITURE
2541 WOOD PARTITIONS & FIXTURES
2542 PARTITIONS, FIXTURES, EXC WOOD
2591 DRAPERY HARDWR, BLINDS, SHADES
2599 FURNITURE & FIXTURES NEC
2611 PULP MILLS
2621 PAPER MILLS
2631 PAPERBOARD MILLS
2652 SETUP PAPERBOARD BOXES
SIC DESCRIPTION
2653 CORRUGATED & SOLID FIBER BOXES
2655 FIBER CANS, DRUMS & SIMLR PDTS
2656 SANITARY FOOD CONTAINERS
2657 FOLDING PAPERBOARD BOXES
2671 COATED & LAMINATED PAPER PKG
2672 COATED & LAMINATED PAPER NEC
2673 COATED, LAMINATED PLASTIC BAGS
2674 UNCOATED PAPER, MULTIWALL BAGS
2675 DIE-CUT PAPER & BOARD
2676 SANITARY PAPER PRODUCTS
2677 ENVELOPES
2678 STATIONERY & RELATED PRODUCTS
2679 CONVERTED PAPER PRODUCTS NEC
2711 NEWSPAPER PUBLISHING
2721 PERIODICAL PUBLISHING
2731 BOOK PUBLISHING
2732 BOOK PRINTING
2741 MISCELLANEOUS PUBLISHING
2752 COMMERCL LITHOGRAPHIC PRINTING
2754 COMMERCIAL GRAVURE PRINTING
2759 COMMERCIAL PRINTING NEC
2761 MANIFOLD BUSINESS FORMS
2771 GREETING CARDS
2782 BLANKBOOKS & LOOSELEAF BINDERS
2789 BOOKBINDING & RELATED WORK
2791 TYPESETTING
2796 PLATEMAKING & RELATED SERVICES
2812 ALKALIES & CHLORINE
2813 INDUSTRIAL GASES
2816 INORGANIC PIGMENTS
2819 INDUST INORGANIC CHEMICALS NEC
2821 PLASTICS MATERIALS & RESINS
2822 SYNTHETIC RUBBER
2823 CELLULOSIC MANMADE FIBERS
2824 ORGANIC FIBERS, EXC CELLULOSIC
2833 MEDICINALS & BOTANICALS
2834 PHARMACEUTICAL PREPARATIONS
2835 DIAGNOSTIC SUBSTANCES
2836 BIOLOGICAL PDTS, EX DIAGNOSTIC
2841 SOAP & OTHER DETERGENTS
2842 POLISHING & SANITATION GOODS
2843 SURFACE ACTIVE AGENTS
2844 COSMETICS, TOILET PREPARATIONS
2851 PAINTS & ALLIED PRODUCTS
2861 GUM & WOOD CHEMICALS

2865 CYCLIC CRUDES & INTERMEDIATES
2869 INDUSTRL ORGANIC CHEMICALS NEC
2873 NITROGENOUS FERTILIZERS
2874 PHOSPHATIC FERTILIZERS
2875 FERTILIZERS, MIXING ONLY
2879 PESTICIDES, AGRI CHEMICALS NEC
2891 ADHESIVES & SEALANTS
2892 EXPLOSIVES
2893 PRINTING INK
2895 CARBON BLACK
2899 CHEMICAL PREPARATIONS NEC
2911 PETROLEUM REFINING
2951 ASPHALT PAVING MIXTRS & BLOCKS
2952 ASPHALT FELTS & COATINGS
2992 LUBRICATING OILS & GREASES
2999 PETROLEUM & COAL PRODUCTS NEC
3011 TIRES & INNER TUBES
3021 RUBBER & PLASTICS FOOTWEAR
3052 RUBBER, PLASTICS HOSE, BELTING
3053 GASKETS, PACKING, SEALING DVCS
3061 MECHANICAL RUBBER GOODS
3069 FABRICATED RUBBER PRODUCTS NEC
3081 UNSUPPTD PLASTICS FILM & SHEET
3082 UNSUPP PLASTICS PROFILE SHAPES

SIC DESCRIPTION

3083 LAMINATD PLASTICS PLATE, SHEET
3084 PLASTICS PIPE
3085 PLASTICS BOTTLES
3086 PLASTICS FOAM PRODUCTS
3087 CUSTM CMPNDG, PRCH PLAST RESIN
3088 PLASTICS PLUMBING FIXTURES
3089 PLASTICS PRODUCTS NEC
3111 LEATHER TANNING & FINISHING
3131 BOOT & SHOE CUT STOCK
3142 HOUSE SLIPPERS
3143 MEN'S FOOTWEAR, EXC ATHLETIC
3144 WOMEN'S FOOTWEAR, EXC ATHLETIC
3149 FOOTWEAR, EXCEPT RUBBER NEC
3151 LEATHER GLOVES & MITTENS
3161 LUGGAGE
3171 WOMENS HANDBAGS & PURSES
3172 PERSONAL LEATHER GOODS NEC
3199 LEATHER GOODS NEC
3211 FLAT GLASS
3221 GLASS CONTAINERS
3229 PRESSED & BLOWN GLASS NEC
3231 PRODUCTS OF PURCHASED GLASS
3241 HYDRAULIC CEMENT
3251 BRICK & STRUCTURAL CLAY TILE
3253 CERAMIC WALL & FLOOR TILE
3255 CLAY REFRACTORIES
3259 STRUCTURAL CLAY PRODUCTS NEC
3261 VITREOUS PLUMBING FIXTURES
3262 VITREOUS CHINA TABLE, KITCHNWR
3263 SEMIVITREOUS TABLE, KITCHENWRE
3264 PORCELAIN ELECTRICAL SUPPLIES
3269 POTTERY PRODUCTS NEC
3271 CONCRETE BLOCK & BRICK
3272 CONCRETE PRODUCTS NEC
3273 READY-MIXED CONCRETE
3274 LIME
3275 GYPSUM PRODUCTS
3281 CUT STONE & STONE PRODUCTS
3291 ABRASIVE PRODUCTS
3292 ASBESTOS PRODUCTS
3295 GROUND OR TREATED MINERALS
3296 MINERAL WOOL
3297 NONCLAY REFRACTORIES
3299 NONMETALLIC MINERAL PDTS NEC
3312 STEEL WORKS & BLAST FURNACES
3313 ELECTROMETALLURGICAL PRODUCTS
3315 STEEL WIRE & RELATED PRODUCTS
3316 COLD-ROLLED STEEL SHAPES
3317 STEEL PIPE & TUBES
3321 GRAY & DUCTILE IRON FOUNDRIES
3322 MALLEABLE IRON FOUNDRIES
3324 STEEL INVESTMENT FOUNDRIES
3325 STEEL FOUNDRIES NEC
3331 PRIMARY COPPER SMELTING
3334 PRIMARY ALUMINUM PRODUCTION
3339 PRIMARY NONFERROUS METALS NEC
3341 SECONDARY NONFERROUS METALS
3351 COPPER ROLLING & DRAWING
3353 ALUMINUM SHEET, PLATE & FOIL
3354 ALUMINUM EXTRUDED PRODUCTS
3355 ALUMINUM ROLLING & DRAWING NEC

3356 NONFERR ROLLING & DRAWING NEC
3357 NONFERR WIREDRWING, INSULATING
3363 ALUMINUM DIE-CASTINGS
3364 NONFERR DIE-CASTINGS, EXC ALUM
3365 ALUMINUM FOUNDRIES
3366 COPPER FOUNDRIES
3369 NONFERROUS FOUNDRIES NEC
3398 METAL HEAT TREATING
SIC DESCRIPTION
3399 PRIMARY METAL PRODUCTS NEC
3411 METAL CANS
3412 METAL BARRELS, DRUMS & PAILS
3421 CUTLERY
3423 HAND & EDGE TOOLS NEC
3425 SAW BLADES & HANDSAWS
3429 HARDWARE NEC
3431 METAL SANITARY WARE
3432 PLUMBING FIXTURE FITTNGS, TRIM
3433 HTG EQUIPT, EXC ELECT FURNACES
3441 FABRICATED STRUCTURAL METAL
3442 METAL DOORS, SASH & TRIM
3443 FABRICATED PLATE WORK
3444 SHEET METAL WORK
3446 ARCHITECTURAL METAL WORK
3448 PREFABRICATED METAL BUILDINGS
3449 MISC STRUCTURAL METAL WORK
3451 SCREW MACHINE PRODUCTS
3452 BOLTS, NUTS, RIVETS & WASHERS
3462 IRON & STEEL FORGINGS
3463 NONFERROUS FORGINGS
3465 AUTOMOTIVE STAMPINGS
3466 CROWNS & CLOSURES
3469 METAL STAMPINGS NEC
3471 PLATING & POLISHING
3479 METAL COATING, ALLIED SVCS NEC
3482 SMALL ARMS AMMUNITION
3483 AMMUNITION, EXCEPT SMALL ARMS
3484 SMALL ARMS
3489 ORDNANCE & ACCESSORIES NEC
3491 INDUSTRIAL VALVES
3492 FLUID PWR VALVES, HOSE FITTNGS
3493 STEEL SPRINGS, EXCEPT WIRE
3494 VALVES & PIPE FITTINGS NEC
3495 WIRE SPRINGS
3496 MISC FABRICATED WIRE PRODUCTS
3497 METAL FOIL & LEAF
3498 FABRICATED PIPE & FITTINGS
3499 FABRICATED METAL PRODUCTS NEC
3511 TURBINES & GENERATOR SETS
3519 INTERNL COMBUSTION ENGINES NEC
3523 FARM MACHINERY & EQUIPMENT
3524 LAWN & GARDEN EQUIPMENT
3531 CONSTRUCTION MACHINERY, EQUIPT
3532 MINING MACHINERY, EQUIPMENT
3533 OIL & GAS FIELD MACHINERY
3534 ELEVATORS & MOVING STAIRWAYS
3535 CONVEYORS, CONVEYING EQUIPMENT
3536 HOISTS, CRANES & MONORAILS
3537 INDUSTRIAL TRUCKS & TRACTORS
3541 METAL CUTTING MACHINE TOOLS
3542 METAL FORMING MACHINE TOOLS
3543 INDUSTRIAL PATTERNS
3544 SPEC DIES, TOOLS, JIGS, FIXTRS
3545 MACHINE TOOL ACCESSORIES
3546 POWER-DRIVEN HANDTOOLS
3547 ROLLING MILL MACHINERY
3548 ELECTRIC & GAS WELDING EQUIPT
3549 METALWORKING MACHINERY NEC
3552 TEXTILE MACHINERY
3553 WOODWORKING MACHINERY
3554 PAPER INDUSTRIES MACHINERY
3555 PRINTING TRADES MACHINERY
3556 FOOD PRODUCTS MACHINERY
3559 SPECIAL INDUSTRY MACHINERY NEC
3561 PUMPS & PUMPING EQUIPMENT
3562 BALL & ROLLER BEARINGS
3563 AIR & GAS COMPRESSORS
3564 INDUSTL & COMML FANS & BLOWERS
SIC DESCRIPTION
3565 PACKAGING MACHINERY
3566 SPEED CHANGERS, DRIVES & GEARS
3567 INDUSTRIAL FURNACES & OVENS
3568 POWER TRANSMISSION EQUIPT NEC
3569 GENERAL INDUSTL MACHINERY NEC
3571 ELECTRONIC COMPUTERS
3572 COMPUTER STORAGE DEVICES
3575 COMPUTER TERMINALS

3577 COMPUTER PERIPHERAL EQUIPT NEC
3578 CALCTG, ACCTG EQPT, EX CMPUTRS
3579 OFFICE MACHINES NEC
3581 AUTOMATIC VENDING MACHINES
3582 COMML LAUNDRY, DRYCLEAN EQUIPT
3585 REFRIGERATION & HEATING EQUIPT
3586 MEASURING & DISPENSING PUMPS
3589 SERVICE INDUSTRY MACHINERY NEC
3592 CARBURETRS, PSTNS, RINGS, VLVS
3593 FLUID PWR CYLINDERS, ACTUATORS
3594 FLUID POWER PUMPS & MOTORS
3596 SCALES, BALANCES, EX LABORATRY
3599 INDUSTRIAL MACHINERY NEC
3612 TRANSFORMERS, EXC ELECTRONIC
3613 SWITCHGEAR, SWITCHBD APPARATUS
3621 MOTORS & GENERATORS
3624 CARBON & GRAPHITE PRODUCTS
3625 RELAYS & INDUSTRIAL CONTROLS
3629 ELECTRIC INDUSTL APPARATUS NEC
3631 HOUSEHOLD COOKING EQUIPMENT
3632 HOUSEHOLD REFRIGERATRS, FRZERS
3633 HOUSEHOLD LAUNDRY EQUIPMENT
3634 ELECTRIC HOUSEWARES & FANS
3635 HOUSEHOLD VACUUM CLEANERS
3639 HOUSEHOLD APPLIANCES NEC
3641 ELECTRIC LAMP BULBS & TUBES
3643 CURRENT-CARRYING WIRING DVICES
3644 NONCURR-CARRYING WIRING DVICES
3645 RESIDENTIAL LIGHTING FIXTURES
3646 COMML, INDUSTL LIGHTING FIXTRS
3647 VEHICULAR LIGHTING EQUIPMENT
3648 LIGHTING EQUIPMENT NEC
3651 HOUSEHOLD AUDIO & VIDEO EQUIPT
3652 PRERECORDED RECORDS & TAPES
3661 TELEPHONE, TELEGRAPH APPARATUS
3663 RADIO, TV COMMUNICATION EQUIPT
3669 COMMUNICATIONS EQUIPMENT NEC
3671 ELECTRON TUBES
3672 PRINTED CIRCUIT BOARDS
3674 SEMICONDUCTORS, RELATD DEVICES
3675 ELECTRONIC CAPACITORS
3676 ELECTRONIC RESISTORS
3677 ELECTRONIC COILS, TRANSFORMERS
3678 ELECTRONIC CONNECTORS
3679 ELECTRONIC COMPONENTS NEC
3691 STORAGE BATTERIES
3692 PRIMARY BATTERIES - DRY & WET
3694 ENGINE ELECTRICAL EQUIPMENT
3695 MAGNETIC, OPTICAL RECRDG MEDIA
3699 ELECTRICAL EQUIPT & SUPPLS NEC
3711 MOTOR VEHICLES & CAR BODIES
3713 TRUCK & BUS BODIES
3714 MOTOR VEHICLE PRTS, ACCESSRIES
3715 TRUCK TRAILERS
3716 MOTOR HOMES
3721 AIRCRAFT
3724 AIRCRAFT ENGINES, ENGINE PARTS
3728 AIRCRAFT PARTS & EQUIPMENT NEC
3731 SHIP BUILDING & REPAIRING
3732 BOAT BUILDING & REPAIRING
3743 RAILROAD EQUIPMENT

SIC DESCRIPTION

3751 MOTORCYCLES, BICYCLES & PARTS
3761 GUIDED MISSILES, SPACE VEHICLS
3764 SPACE PROPULSION UNITS & PARTS
3769 SPACE VEHICLE EQUIPMENT NEC
3792 TRAVEL TRAILERS & CAMPERS
3795 TANKS & TANK COMPONENTS
3799 TRANSPORTATION EQUIPMENT NEC
3812 SEARCH & NAVIGATION EQUIPMENT
3821 LABORATRY APPARATUS, FURNITURE
3822 ENVIRONMENTAL CONTROLS
3823 PROCESS CONTROL INSTRUMENTS

3824 FLUID METERS, COUNTING DEVICES
3825 ELECTRICITY MEASURNG INSTRMNTS
3826 LABRTRY ANALYTICAL INSTRUMENTS
3827 OPTICAL INSTRUMENTS & LENSES
3829 MEASURING, CONTROL DEVICES NEC
3841 SURGICAL & MEDICAL INSTRUMENTS
3842 SURGICAL APPLIANCES & SUPPLIES
3843 DENTAL EQUIPMENT & SUPPLIES
3844 X-RAY APPARATUS & TUBES
3845 ELECTROMEDICAL EQUIPMENT
3851 OPHTHALMIC GOODS
3861 PHOTOGRAPHIC EQUIPT & SUPPLIES
3873 WATCHES, CLOCKS, CASES & PARTS
3911 PRECIOUS METAL JEWELRY
3914 SILVERWARE & PLATED WARE
3915 JEWELERS' MATLS, LAPIDARY WORK
3931 MUSICAL INSTRUMENTS
3942 DOLLS & STUFFED TOYS
3944 GAMES, TOYS, CHILDN'S VEHICLES
3949 SPORTING & ATHLETIC GOODS NEC
3951 PENS & MECHANICAL PENCILS
3952 LEAD PENCILS & ART GOODS
3953 MARKING DEVICES
3955 CARBON PAPER & INKED RIBBONS
3961 COSTUME JEWELRY & NOVELTIES
3965 FASTENRS, BUTTNS, NEEDL, PINS
3991 BROOMS & BRUSHES
3993 SIGNS, ADVERTISING SPECIALTIES
3995 BURIAL CASKETS
3996 HARD SURFACE FLOOR CVRINGS NEC
3999 MANUFACTURING INDUSTRIES NEC
4111 LOCAL & SUBURBAN TRANSIT
4119 LOCAL PASSENGER TRANSPORT NEC
4121 TAXICAB SERVICE
4131 INTERCITY, RURAL BUS TRANSPORT
4141 LOCAL BUS CHARTER SERVICE
4142 BUS CHARTER SERVICE, EXC LOCAL
4151 SCHOOL BUS OPERATION
4173 BUS TERMINAL & SVC FACILITIES
4210 TRUCKING AND COURIER SERVICES
4221 FARM PDT WAREHOUSING & STORAGE
4222 REFRIGRTD WAREHOUSING, STORAGE
4225 GENERAL WAREHOUSING & STORAGE
4226 SPECL WAREHOUSING, STORAGE NEC
4231 TRUCKING TERMINAL FACILITIES
4412 DEEP SEA FOREIGN FRT TRANSPORT
4424 DEEP SEA DOMEST FRT TRANSPORT
4432 GREAT LAKES FREIGHT TRANSPORT
4449 WATER FREIGHT TRANSPORT NEC
4481 DEEP SEA PSNGR TRANS, EX FERRY
4482 FERRY OPERATION
4489 WATER PASSENGER TRANSPORT NEC
4491 MARINE CARGO HANDLING
4492 TOWING & TUGBOAT SERVICES
4493 MARINA OPERATION
4499 WATER TRANSPORTATION SVCS NEC
4510 TRANSPORTAION BY AIR
4522 NONSCHEDULED AIR TRANSPORTATN

SIC DESCRIPTION

4581 AIRPORTS, FLYING FIELDS & SVCS
4610 PIPELINES EXCEPT NAT. GAS
4724 TRAVEL AGENCIES
4725 TOUR OPERATORS
4729 PSNGR TRANSPORT ARRANGEMNT NEC
4731 FREIGHT TRANSPORT ARRANGEMENT
4741 RAILROAD CAR RENTAL
4780 MISCELLANEOUS TRANSPORTAION SR
4812 RADIOTELEPHONE COMMUNICATIONS
4813 TELEPHONE COMMUNCATN, EX RADIO
4822 TELEGRAPH & OTH COMMUNICATIONS
4830 RADIO AND TV BROADCATING STATI
4841 CABLE & OTHER PAY TV SERVICES

4899 COMMUNICATIONS SERVICES NEC
4911 ELECTRIC SERVICES
4920 GAS PRODUCTION AND DISTRIBUTIO
4931 ELECTRIC & OTHER SVCS COMBINED
4932 GAS & OTHER SERVICES COMBINED
4939 COMBINATION UTILITIES NEC
4941 WATER SUPPLY
4950 SANITARY SERVICES
4961 STEAM, AIR-CONDITIONING SUPPLY
4971 IRRIGATION SYSTEMS
5012 AUTOMOBILES, OTH MOTOR VEHICLS
5013 MOTOR VEHICLE SUPPS, NEW PARTS
5014 TIRES & TUBES
5015 USED MOTOR VEHICLE PARTS
5021 FURNITURE
5023 HOMEFURNISHINGS
5031 LUMBER, PLYWOOD & MILLWORK
5032 BRICK, STONE & RELATED MATLS
5033 ROOFING, SIDING & INSULATION
5039 CONSTRUCTION MATERIALS NEC
5043 PHOTOGRAPHIC EQUIPT & SUPPLIES
5044 OFFICE EQUIPMENT
5045 COMPUTRS, PERIPHERALS, SOFTWRE
5046 COMMERCIAL EQUIPMENT NEC
5047 MEDICAL & HOSPITAL EQUIPMENT
5048 OPHTHALMIC GOODS
5049 PROFESSIONAL EQUIPMENT NEC
5051 METALS SVC CENTERS & OFFICES
5052 COAL & OTHER MINERALS & ORES
5063 ELECTRICAL APPARATUS & EQUIPT
5064 ELECTRIC APPLIANCE, TV, RADIOS
5065 ELECTRONIC PARTS & EQUIPT NEC
5072 HARDWARE
5074 PLUMBING, HYDRONIC HEATNG SUPP
5075 WARM AIR HEATING, AIR-CONDITNG
5078 REFRIGERATION EQUIPT, SUPPLIES
5082 CONSTRUCTION, MINING MACHINERY
5083 FARM & GARDEN MACHINERY
5084 INDUSTRIAL MACHINERY & EQUIPT
5085 INDUSTRIAL SUPPLIES
5087 SERVICE ESTABLISHMENT EQUIPT
5088 TRANSPORT EQUIPMENT & SUPPLIES
5091 SPORTING & RECREATIONAL GOODS
5092 TOYS & HOBBY GOODS & SUPPLIES
5093 SCRAP & WASTE MATERIALS
5094 JEWELRY & PRECIOUS STONES
5099 DURABLE GOODS NEC
5111 PRINTING & WRITING PAPER
5112 STATIONERY & OFFICE SUPPLIES
5113 INDUSTRIAL, PERSONAL SVC PAPER
5122 DRUGS, PROPRIETARIES, SUNDRIES
5131 PIECE GOODS & NOTIONS
5136 MEN'S & BOYS' CLOTHING
5137 WOMEN'S & CHILDREN'S CLOTHING
5139 FOOTWEAR
5141 GROCERIES - GENERAL LINE

SIC DESCRIPTION

5142 PACKAGED FROZEN FOODS
5143 DAIRY PDTS, EX DRIED OR CANNED
5144 POULTRY & POULTRY PRODUCTS
5145 CONFECTIONERY
5146 FISH & SEAFOODS
5147 MEATS & MEAT PRODUCTS
5148 FRESH FRUITS & VEGETABLES
5149 GROCERIES & RELATED PDTS NEC
5153 GRAIN & FIELD BEANS
5154 LIVESTOCK
5159 FARM-PRODUCT RAW MATERIALS NEC
5162 PLASTICS MATLS & BASIC SHAPES
5169 CHEMICALS, ALLIED PRODUCTS NEC
5171 PETROLEUM BULK STATNS, TERMNLS
5172 PETROLEUM PRODUCTS NEC
5181 BEER & ALE
5182 WINE & DISTILLED BEVERAGES
5191 FARM SUPPLIES
5192 BOOKS, PERIODICALS, NEWSPAPERS
5193 FLOWERS & FLORISTS' SUPPLIES
5194 TOBACCO & TOBACCO PRODUCTS
5198 PAINTS, VARNISHES & SUPPLIES

5199 NONDURABLE GOODS NEC
5211 LUMBER & OTHER BLDG MATL DLRS
5231 PAINT, GLASS, WALLPAPER STORES
5251 HARDWARE STORES
5261 RETAIL NURSRIES, GARDEN STORES
5271 MOBILE HOME DEALERS
5311 DEPARTMENT STORES
5331 VARIETY STORES
5399 MISC GENL MERCHANDISE STORES
5411 GROCERY STORES
5421 MEAT & FISH MARKETS
5431 FRUIT & VEGETABLE MARKETS
5441 CANDY, NUT, CONFECTIONERY STRS
5451 DAIRY PRODUCTS STORES
5461 RETAIL BAKERIES
5499 MISCELLANEOUS FOOD STORES
5511 NEW & USED MOTOR VEHICLE DLRS
5521 USED CAR DEALERS
5531 AUTO & HOME SUPPLY STORES
5541 GASOLINE SERVICE STATIONS
5551 BOAT DEALERS
5561 RECREATIONAL VEHICLE DEALERS
5571 MOTORCYCLE DEALERS
5591 AUTOMOTIVE DEALERS NEC
5611 MEN'S & BOYS' CLOTHING STORES
5621 WOMEN'S CLOTHING STORES
5632 WOMEN'S ACCESSRY, SPECLTY STRS
5641 CHILDREN'S, INFANTS' WEAR STRS
5651 FAMILY CLOTHING STORES
5661 SHOE STORES
5699 MISC APPAREL, ACCESSORY STORES
5712 FURNITURE STORES
5713 FLOOR COVERING STORES
5714 DRAPERY & UPHOLSTERY STORES
5719 MISC HOMEFURNISHINGS STORES
5722 HOUSEHOLD APPLIANCE STORES
5731 RADIO, TV & ELECTRONICS STORES
5734 COMPUTER & SOFTWARE STORES
5735 RECORD & PRERECORDED TAPE STRS
5736 MUSICAL INSTRUMENT STORES
5812 EATING PLACES
5813 DRINKING PLACES
5912 DRUG STORES & PROPRIETARY STRS
5921 LIQUOR STORES
5932 USED MERCHANDISE STORES
5941 SPORTING GOODS & BICYCLE SHOPS
5942 BOOK STORES

SIC DESCRIPTION

5943 STATIONERY STORES
5944 JEWELRY STORES
5945 HOBBY, TOY, & GAME SHOPS
5946 CAMERA, PHOTOGRAPHIC SPLY STRS
5947 GIFT, NOVELTY & SOUVENIR SHOPS
5948 LUGGAGE & LEATHER GOODS STORES
5949 SEWING, NEEDLWORK, PC GDS STRS
5961 CATALOG & MAIL-ORDER HOUSES
5962 MERCHANDISING MACHINE OPERATRS
5963 DIRECT SELLING ESTABLISHMENTS
5983 FUEL OIL DEALERS
5984 LIQUEFIED PETROLEUM GAS DEALRS
5989 FUEL DEALERS NEC
5992 FLORISTS
5993 TOBACCO STORES & STANDS
5994 NEWS DEALERS & NEWSSTANDS
5995 OPTICAL GOODS STORES
5999 MISC RETAIL STORES NEC
6010 CENTRAL RESERVE DEPOSITORIES
6020 COMMERCIAL BANKS
6030 SAVINGS INSTITUTIONS
6060 CREDIT UNIONS
6080 FOREIGN BANK BRANCHES, AGNCIES
6090 FUNCTNS RELATD TO DEPOS BANKNG
6111 FEDL, FED SPONSRD CREDIT AGNCS
6141 PERSONAL CREDIT INSTITUTIONS
6150 BUSINESS CREDIT INSTITUTIONS
6160 MORTGAGE BANKERS & BROKERS
6211 SECURITY BROKERS & DEALERS
6221 COMMODITY CONTRCTS BRKRS, DLRS
6231 SECURITY & COMMODITY EXCHANGES
6280 SECURITY & COMMODITY SERVICES
6311 LIFE INSURANCE
6321 ACCIDENT & HEALTH INSURANCE
6324 HOSPITAL & MEDICAL SVC PLANS

6331 FIRE, MARINE, CASLTY INSURANCE
6351 SURETY INSURANCE
6361 TITLE INSURANCE
6371 PENSION, HEALTH, WELFARE FUNDS
6399 INSURANCE CARRIERS NEC
6411 INSURANCE AGTS, BROKERS & SVCS
6510 REAL ESTATE OPERATORS & LESSOR
6531 REAL ESTATE AGENTS & MANAGERS
6541 TITLE ABSTRACT OFFICES
6552 SUBDIVIDERS & DEVELOPERS
6553 CEMETERY SUBDIVIDRS, DEVELOPRS
6710 HOLDING COMPANIES
6720 INVESTMENT OFFICES
6732 EDUC, RELIG, CHARITABLE TRUSTS
6733 TRUSTS NEC
6792 OIL ROYALTY TRADERS
6794 PATENT OWNERS & LESSORS
6798 REAL ESTATE INVESTMENT TRUSTS
6799 INVESTORS NEC
7011 HOTELS & MOTELS
7021 ROOMING & BOARDING HOUSES
7032 SPORTING & RECREATIONAL CAMPS
7033 TRAILER PARKS & CAMPSITES
7041 MEMBRSHP-BASIS ORGANIZN HOTELS
7211 FAMILY & COMML POWER LAUNDRIES
7212 GARMENT PRESSING, CLNRS' AGTS
7213 LINEN SUPPLY
7215 COIN-OP LAUNDRIES & CLEANING
7216 DRYCLEANING PLANTS, EXCEPT RUG
7217 CARPET & UPHOLSTERY CLEANING
7218 INDUSTRIAL LAUNDERERS
7219 LAUNDRY & GARMENT SERVICES NEC
7221 PORTRAIT PHOTOGRAPHY STUDIOS
7231 BEAUTY SHOPS

SIC DESCRIPTION

7241 BARBER SHOPS
7251 SHOE REPAIR, SHOESHINE PARLORS
7261 FUNERAL SERVICE & CREMATORIES
7291 TAX RETURN PREPARATION SVCS
7299 MISC PERSONAL SERVICES NEC
7311 ADVERTISING AGENCIES
7312 OUTDOOR ADVERTISING SERVICES
7313 RADIO, TV, PUBLISHERS' REPS
7319 ADVERTISING NEC
7322 ADJUSTMENT & COLLECTION SVCS
7323 CREDIT REPORTING SERVICES
7331 DIRECT MAIL ADVERTISING SVCS
7334 PHOTOCOPYING, DUPLICATING SVCS
7335 COMMERCIAL PHOTOGRAPHY
7336 COMMERCIAL ART, GRAPHIC DESIGN
7338 SECRETARIAL, COURT REPRTG SVCS
7342 DISINFECTNG, PEST CONTROL SVCS
7349 BUILDING MAINTENANCE SVCS NEC
7352 MEDICAL EQUIPT RENTAL, LEASING
7353 HVY CONSTRUCTION EQUIPT RENTAL
7359 EQUIPMENT RENTAL & LEASING NEC
7361 EMPLOYMENT AGENCIES
7363 HELP SUPPLY SERVICES
7371 COMPUTER PROGRAMMING SERVICES
7372 PREPACKAGED SOFTWARE
7373 COMPUTER INTEGRATD SYST DESIGN
7374 COMPUTER PROC & DATA PREP SVCS
7375 INFORMATION RETRIEVAL SERVICES
7376 COMPUTER FACILITIES MGMNT SVCS
7377 COMPUTER RENTAL & LEASING
7378 COMPUTER MAINTENANCE & REPAIR
7379 COMPUTER RELATED SERVICES NEC
7381 DETECTV, GUARD, ARMRD CAR SVCS
7382 SECURITY SYSTEMS SERVICES
7383 NEWS SYNDICATES
7384 PHOTOFINISHING LABORATORIES
7389 BUSINESS SERVICES NEC
7513 TRUCK RENTL, LEASNG, W/O DRVRS
7514 PASSENGER CAR RENTAL
7515 PASSENGER CAR LEASING
7519 UTIL TRAILR, REC VEHICL RENTAL

7521 AUTOMOBILE PARKING
7532 TOP & BODY REPAIR, PAINT SHOPS
7533 AUTO EXHAUST SYST REPAIR SHOPS
7534 TIRE RETREADING & REPAIR SHOPS
7536 AUTO GLASS REPLACEMENT SHOPS
7537 AUTO TRANSMISSION REPAIR SHOPS
7538 GENL AUTOMOTIVE REPAIR SHOPS
7539 AUTOMOTIVE REPAIR SHOPS NEC
7542 CARWASHES
7549 AUTOMOTIVE SERVICES NEC
7622 RADIO & TV REPAIR SHOPS
7623 REFRIGERATN SVC, REPAIR SHOPS
7629 ELECTRICAL REPAIR SHOPS NEC
7631 WATCH, CLOCK, JEWLRY REPR SHPS
7641 REUPHOLSTRY, FURNITR REPR SVCS
7692 WELDING REPAIR SHOPS
7694 ARMATURE REWINDING SHOPS
7699 REPAIR SHOPS, RELATED SVCS NEC
7812 MOTION PICTURE, VIDEO PRODUCTN
7819 MOTION PICTURE PRODUCTION SVCS
7822 MOTION PICTURE & TAPE DISTRIB
7829 MOTION PICTURE DISTRIBUTN SVCS
7832 MOTION PICTR THTRS, EXC DRV-IN
7833 DRIVE-IN MOTION PICTURE THTRS
7841 VIDEO TAPE RENTAL
7911 DANCE STUDIOS, SCHOOLS & HALLS
7922 THEATRICAL PRODUCERS & SVCS
7929 BANDS, ORCHESTS, ENTRTNRS, GPS

SIC DESCRIPTION

7933 BOWLING CENTERS
7941 PROFESS SPORTS CLUBS, PROMOTRS
7948 RACING, INCL TRACK OPERATION
7991 PHYSICAL FITNESS FACILITIES
7992 PUBLIC GOLF COURSES
7993 COIN-OPERATD AMUSEMENT DEVICES
7996 AMUSEMENT PARKS
7997 MEMBRSHP SPORTS, RECREATN CLBS
7999 AMUSEMENT, RECREATN SVCS NEC
8011 MEDICAL DRS' OFFICES & CLINICS
8021 DENTISTS' OFFICES & CLINICS
8031 OSTEOPATHIC DRS' OFCS, CLINICS
8041 CHIROPRACTORS' OFCS & CLINICS
8042 OPTOMETRISTS' OFCS & CLINICS
8043 PODIATRISTS'OFFAICES & CLINICS
8049 HLTH PRACTRS' OFCS, CLNICS NEC
8050 NURSING AND PERSONAL CARE FACI
8060 HOSPITALS
8071 MEDICAL LABORATORIES
8072 DENTAL LABORATORIES
8082 HOME HEALTH CARE SERVICES
8090 HEALTH & ALLIED SERVICES NEC
8111 LEGAL SERVICES
8211 ELEMENTARY & SECONDARY SCHOOLS
8220 COLLEGES & UNIVERSITIES
8231 LIBRARIES
8240 VOCATIONAL SCHOOLS
8299 SCHOOLS & EDUCATIONAL SVCS NEC
8322 INDIVIDUAL, FAMILY SOCIAL SVCS
8331 JOB TRAINING & RELATED SVCS
8351 CHILD DAY CARE SERVICES
8361 RESIDENTIAL CARE SERVICES
8399 SOCIAL SERVICES NEC
8412 MUSEUMS & ART GALLERIES
8422 BOTONICAL & ZOOLOGICAL GARDENS
8611 BUSINESS ASSOCIATIONS
8621 PROFESSNL MEMBRSHP ORGANIZATNS
8631 LABOR UNIONS, LABOR ORGANIZTNS
8641 CIVIC, SOCIAL, FRATERNAL ASSNS
8651 POLITICAL ORGANIZATIONS
8661 RELIGIOUS ORGANIZATIONS
8699 MEMBERSHIP ORGANIZATIONS NEC
8711 ENGINEERING SERVICES
8712 ARCHITECTURAL SERVICES

8713 SURVEYING SERVICES
8721 ACCTG, AUDIT, BOOKKEEPING SVCS
8731 COMML PHYSICL, BIOLOG RESEARCH
8732 COMMERCL NONPHYSICAL RESEARCH
8733 NONCOMML RESEARCH ORGANIZATNS
8734 TESTING LABORATORIES
8741 MANAGEMENT SERVICES
8742 MANAGEMENT CONSULTING SERVICES
8743 PUBLIC RELATIONS SERVICES
8744 FACILITIES SUPPORT MGMNT SVCS
8748 BUSINESS CONSULTING SVCS NEC
8999 SERVICES NEC
9000 FED, STATE AND LOCAL GOVERNMENT

US Energy Modeling System

24 Hartwell Avenue, Lexington, MA 02421

US Energy Modeling System

Overview

The US outlook for energy is prepared using the Global Insight Energy Modeling System, which was designed to analyze the impacts of major energy issues on the North American energy sector and the feedback effects from energy markets on its economies. The system is composed of the Global Insight Macroeconomic Models of the U.S. and Canada and the Global Insight U.S. Energy Models.

The Energy Modeling System ensures that forecasts of energy demand and economic activity are mutually consistent. The Macro Model defines the economic environment in which the energy markets are operating. Projections of real GDP growth, inflation, industrial production, employment, income, housing, vehicle sales, etc., are provided to the Energy Model from the Macro Model. Also feeding into the Energy Model is a complete array of present and expected future energy regulations which impact the pricing and/or availability of domestic energy supplies, assumptions regarding the technical or efficiency characteristics of the energy-using capital stocks, and world oil prices. With these inputs, the Energy Model determines the prices, demands, and supplies of the major energy sources in the United States.

Forecasts of fuel consumption are also mutually consistent. Coal, oil, gas and electricity compete for demand on the basis of efficiency-adjusted prices. As demand for a fuel increases, however, the supply price of that fuel also increases, which dampens further demand growth.

A brief overview of the US Energy Model follows.

U.S. Energy Model (Long-term)

Global Insight's U.S. Energy Model has been designed to analyze the factors that determine the outlook for U.S. energy markets. A staff of over 15 energy professionals supports the model and forecasting effort. The modeling system is constructed as a system of models that can be used to independently assess intra-market issues. The integrated system is used to produce Global Insight's baseline Energy Outlook and allows users to simulate changes in domestic energy markets.

The U.S. Energy Model is an integrated system of fuel and electric power models and the End-use Demand Model. Final solution is achieved through an iterative procedure. Also, monthly models of petroleum and natural gas prices use the framework of the long-term forecast with additional weekly and monthly information to analyze seasonal fuel prices and to update the price forecasts on a monthly basis. The major models of the Energy Model and their inter-relationships are described below.

End-use Demand Model

Demand for final energy is modeled by sector by fuel by census region, based on the competitive position of each fuel in its end-market. The total demand for energy is estimated as a function of

the stock of energy equipment, technology change, prices of competing final energy sources and economic performance. The initial demand profile by region for the U.S. for each fuel is then integrated with the US Petroleum, Natural Gas, Coal and Electric Power Models, which each consist of three major sub-modules -- a supply and transformation module, a transportation/transmission/distribution module, and a wholesale/retail price module.

U.S. Petroleum Model

The U.S. Petroleum Model uses the world oil price projection from Global Insight's Global Oil Outlook. The model then determines refined petroleum product prices to end-users by adding refining markups, inventory, and transportation costs. For selected products, federal, state and local taxes are also accounted for in the model. The U.S. Petroleum Model also provides a baseline projection of U.S. crude and NGL production that is based on an annual review of data/literature on US reserves, production, and technological progress. A simulation block for investigating the supply response under alternative assumptions is part of this module. Imported supplies of crude and petroleum products are developed by difference between domestic production and the sum of the direct consumption of petroleum by consumers and the transformation demand for petroleum by the power sector.

Natural Gas Model

The Natural Gas Model consists of three major submodules, a spot pricing model, a supply module, and a transmission/distribution module. The supply module projects production based on analysis of US reserve data, exploratory and development drilling and technological progress. A simulation block for investigating supply responses under alternative assumptions is part of this module. The transmission/distribution module projects cost by customer class. The spot-pricing model integrates the results of the End-use Demand Model, the natural gas demand by the power sector from the Electric Power Model, and the embedded supply and transmission/distribution modules to determine producer prices by basin. A final solution is developed through an interactive process.

Coal Model

The Coal Model is a simulation model designed to replicate the market response of this sector under alternative scenarios. Finalized through the interactive process, the baseline market analysis is provided by JD Energy (an affiliated coal and power consulting firm) that includes analysis and forecasts of coal production, rail costs, coal flows, and coal prices.

Electric Power Model

The U.S. Electric Power Model is a detailed, regional (census and NERC region) model of the power generation sector combined with a more aggregate model of the regional transmission and distribution sector. The preliminary demand for regional generation is determined as a function of the demand for electricity determined in the End-use Demand Model, transmission losses and trade. Generation requirements are met through the capacity module, which projects capacity decisions based on fuel prices, O&M costs, and technological progress. Utilization is projected

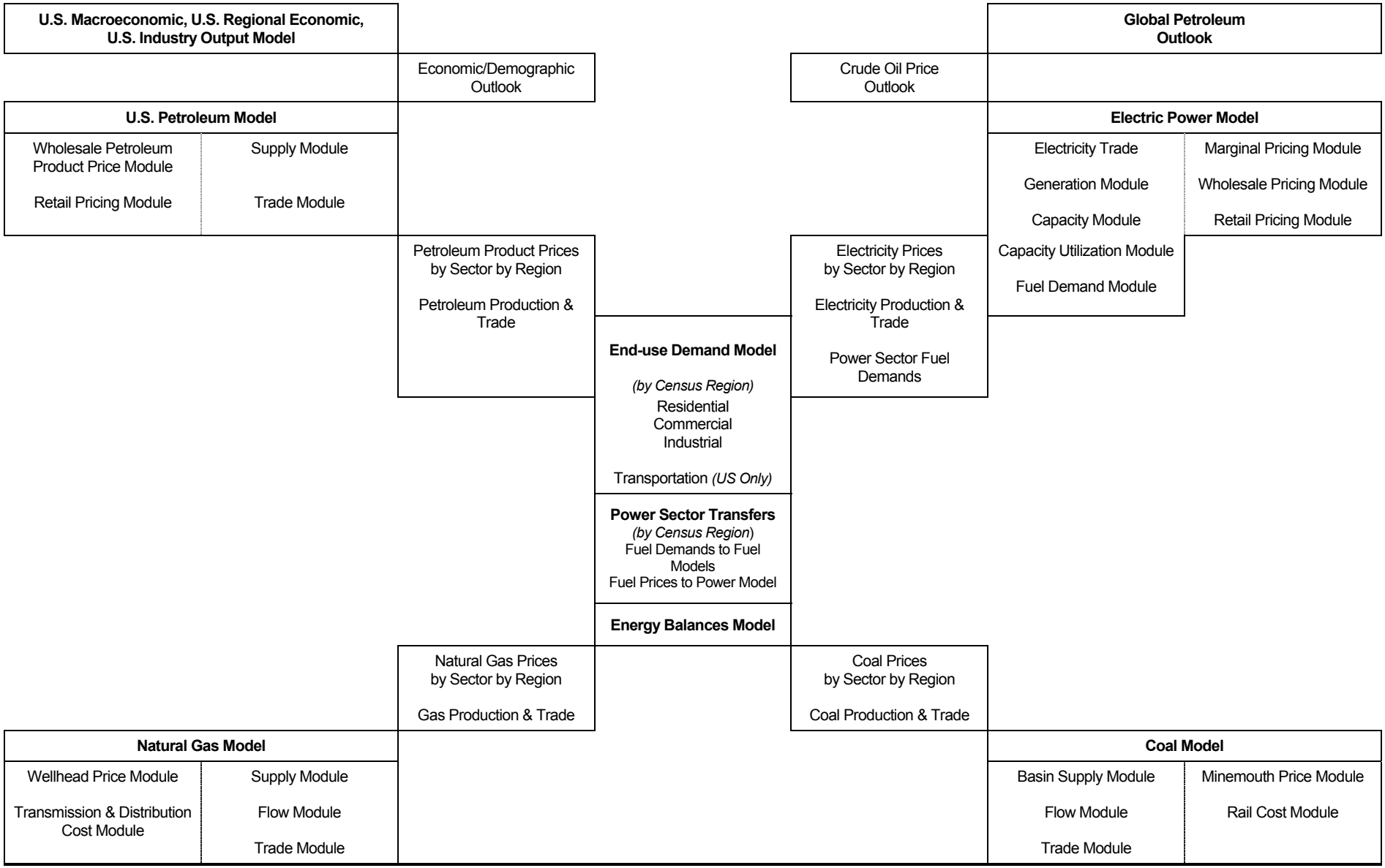
as a function of load and marginal production cost. Average wholesale prices are calculated, and successive iterations allow for an assessment of the price of electricity that balances demand and capacity. Through this analysis, a preliminary demand for a fuel by the power sector is developed that is finalized in the iterative process.

Energy Balances Model

The Energy Balances Model completes the process. This model provides national and regional summations of energy use across fuel and customer class.

A schematic of the U.S. Energy Modeling System is shown below.

GLOBAL INSIGHT'S U.S. ENERGY MODEL (Long-term)



US Energy Modeling System

Overview of Monthly Price Forecasts (Short-term)

Global Insight prepares forecasts of key petroleum and natural gas prices every month. Twice a year, a 25-year forecast is produced. For the major countries of the world, Global Insight provides a 25-year forecast of end use prices by sector.

The Global Insight forecasts of energy prices are based upon a detailed model encompassing fundamentals such as demand, production, deliverability, storage draw, storage inventories, heating degree days, other prices, shut-in decisions, pipeline expansions and regulatory variables. The oil and gas price forecast prepared by Global Insight is widely used throughout the North American oil and gas industry as a strategic tool in making timely purchase and sale decisions.

Crude and Petroleum Products

WTI and North American petroleum products are traded in both physical markets as well as on commodity exchanges. Products are traded in large and very competitive spot markets on the New York and Gulf Coast. These prices for physical trades are reported in Platt's. The presence of futures markets adds depth and price discovery to the physical trading. The futures contract for the WTI is one of the most widely traded commodity contracts in the world. Consequently, the reported prices are often used as indices for petroleum and natural gas price determination.

The U.S. Gulf Coast is the largest petroleum products market in the Americas. Trends in U.S. energy markets have a major effect on the product prices. Recent product specification changes such as reformulated gasoline, low sulfur diesel fuel and the Clean Air Act Amendments are changing pricing relationships. Product prices in the Gulf Coast market interact with the WTI market.

The North American concepts for which Global Insight Energy regularly prepares petroleum forecasts are itemized in Table 1.

Natural Gas

Natural gas price forecasts are prepared using the Natural Gas Monthly Spot Model that uses inputs from other Global Insight models and data sources. Prices are forecast by month, through the next three calendar years, for all major North American producing basins and numerous citygates. The price forecasts reflect the combined influences of gas supply/demand balances, time of year, and price of competing oil.

Oil prices have a pervasive effect on natural gas prices, not only because natural gas is often produced in association with oil and drilling activity responds to both prices but also because of competition in end use markets. Both low sulfur #6 and #2 fuel oils are used as the competing oil price. For off-peak months, the influential competing oil price is that of low sulfur residual oil, because it competes with gas in the boiler fuel market---the market in

which short-term switching between oil and gas is most convenient. The price of low sulfur residual fuel (after adjustment for transportation cost differences) has proven in the past to generally be above the gas price.

During the off-peak period, the oil price has less influence on spot gas prices. The off-peak surplus induces a high degree of competition among gas suppliers that often drives gas prices well below the oil price ceiling.

Distillate fuel oil is the ceiling price for natural gas during the peak months of December and January. Many combined cycle generation plants in the U.S. can only use distillate fuel oil. When gas supplies are interrupted during winter months, distillate is used instead. The effect of oil prices on gas prices is typically most significant during the peak period for natural gas demand and prices.

Separate price equations for each of the basins have been econometrically estimated based on historical analyses of the combined influence of the supply/demand pressures, discussed above, and oil prices. The result is a price forecast for each basin that reflects historical responses to these sometimes contradictory and seasonally varying factors. Price differentials between basins, based on transportation costs, are also taken into account.

For natural gas pipeline tariffs, a Pipeline Rate model is based on a pro forma analysis of the pipeline's cost structure. These include firm and interruptible rates, as well as rolled-in or incremental charges using a pro-forma methodology for escalating interstate pipeline tariffs for system supply and transportation services. The methodology is built around a pro forma financial model, the outputs from which are used to drive a rate model. The pipeline rate model is based on the straight-fixed variable rate (SFVR) design format mandated by the Federal Energy Regulatory Commission (FERC) for interstate pipeline rate design. The key inputs to the model include depreciation rate, debt/equity ratio, allowed rate of return, tax rate, construction expenditure and capacity, throughput volume, fuel retention, rate design, embedded cost of capital, wages and operating expenditures, and construction costs.

The North American concepts for which Global Insight’s Energy Service regularly prepares forecasts are itemized in Table 2.

US Energy Modeling System

Table 1: Global Insight's Petroleum Fuel Price Projections (Short-term)

PRODUCT	DESCRIPTION
Crude Oil	
	West Texas Intermediate, Cushing
	Brent Blend, UK
	Edmonton Par, Alberta
	Bow River, Alberta
Liquified Petroleum Gas	
Ethane	Ethane - Mt Belvieu, TX
Propane	Conway, TX, Mt Belvieu, TX, and Selkirk, NY
Refined Products	
Jet Fuel	Jet Fuel/Kerosene, New York Harbor, Chicago, LA, Gulf Coast
Motor Gasoline	Unleaded Motor gasoline, New York Harbor, Oxygenated and Reformulated
	Unleaded Motor Gasoline, Gulf Coast
Distillate	NY Harbor #2
	NY Harbor #2 Low Sulfur
	Gulf Coast #2
	NY Harbor #2 Low Sulfur
	Philadelphia #2
	Philadelphia #4 Oil, 0.5% Sulfur
Residual Fuel	New York Harbor Cargoes, 1% Sulfur, 0.3% low pour, 0.7%, 2.2% and 3.0%
	Gulf Coast Cargoes, 0.7%, 1.0%, 2.2% and 3.5%
	Philadelphia 0.5% Sulfur
European Product Prices using Platt's Specifications For: Northwest Europe, Rotterdam, Mediterranean	
Naphtha	
Gasoline	Premium Unleaded
Jet Kerosene	
Gasoil	
Heavy Fuel Oil	1% and 3.5% Sulfur
European Retail Prices For: Germany, France, United Kingdom, Italy, Belgium, Netherlands, Spain, Denmark	
Premium Gasoline	
Automotive Diesel	
Heating Oil	
Heavy Fuel Oil	

US Energy Modeling System

Table 2: Global Insight's Natural Gas Fuel Price Projections (Short-term)

PRODUCT	DESCRIPTION
Natural Gas Basins	AECO C Hub, Alberta
	Empress, Alberta
	Appalachia
	Rocky Mountain
	Permian
	San Juan
	Mid-continent
	Gulf Coast
Citygates	New England
	New York, New Jersey
	Southeast Citygate
	Chicago
	Pacific Northwest
	Topock, California, PGE Citygate California
Gulf Coast	Henry Hub
	Texas Eastern, South Texas
	Texas Eastern, East La.
	Texas Eastern, East Texas
	Texas Eastern, West Louisiana
	Transco, Station 30 South Texas
	Transco, Station 45 East Texas
	Transco, Station 65 South Louisiana
	Katy
	Houston Ship Channel, Large Packages (3500 mcf/day and up)
	Louisiana Hub
	Waha
Canadian Export	Kingsgate, B.C.
	Sumas
	Monchy
	Ventura
	Emerson
	Niagara
	Toronto, Ontario
	Malin, Oregon

US Energy Modeling System

Forecast Concepts in the US Energy Outlook (Long-term)

The US Energy Outlook provides a long-term assessment of energy market fundamentals discussed in light of the evolution of the regulatory structure, technological change and environmental regulations. The report provides both forecast data and analysis of key market uncertainties. Forecasts of the following concepts are provided at an annual frequency to the year 2025.

Fuels	Price Concepts	Demand Sectors	Demand Regions	Supply Regions
Petroleum				
Crude Oil	Traded, Wholesale			Domestic, US Imports, US Exports
Gasoline	Traded, Wholesale		US	
	Retail	Com, Ind, Tran	US	
Diesel	Traded, Wholesale		US	
	Retail	Tran	US	
Distillate/Home Heating Oil	Traded, Wholesale		US	
	Retail	Res, Com, Ind, Power	Census Region, US	
Jet Fuel/Kerosene	Traded, Wholesale, Retail	Tran	US	
Residual Fuel Oil (%s)	Traded, Wholesale		US	
	Retail	Com, Ind, Tran, Power	Census Regions, US	
Natural Gas	Wellhead by Basin, Canadian Border Prices Wholesale, Retail	Res, Com, Ind, Tran, Power	Census Regions, US & Provinces, Canada	Domestic by Basin, Imports by Origin, Exports by Destination
			Flows between demand and supply regions	
Coal	Minemouth by Basin, Transportation Cost, Retail/Delivered	Res/Com/Ind, Power	Census Regions, US	Domestic by Basin, Net Imports, Net Exports
			Flows between demand and supply regions	
Nuclear	Delivered Cost	Power	US	
Power Supply				
Electricity	Retail	Res, Com, Ind, Tran	Census Regions, US	
Generation	Average cost of generation		Census Regions, US	Domestic Generation, Imports by Origin Exports by Destination
Capacity by fuel type	Marginal cost of generation from new capacity		Census Regions, US	

Regional Economic Model
Approach and Methodology

A. Overview of Modeling Approach

The Global Insight approach to state and metropolitan area models represents a significant departure from most previous multi-regional modeling and forecasting efforts. Most other regional models are constructed as proportions of the United States. In the Global Insight system, however, each area is modeled individually and then linked into a national system. Thus, our models do not forecast regional growth as simple proportions of U.S. totals, but focus on internal growth dynamics and differential business cycle response. This approach is referred to as "top-down bottom-up." It contrasts sharply with pure share (top-down) models, and models which are not linked to a national macroeconomic model (bottom-up), and contains the best of both approaches.

Our basic objective is to project how regional activity varies, given an economic environment as laid out by Global Insight's Macroeconomic and Industry forecasts. In order to do this, we must be able to explain the two key phenomena:

- why states react differently from one another over the business cycle
- why states grow or decline relative to each other over the longer run.

These issues are addressed using information about detailed industrial mix, interindustry and interregional relationships, productivity and relative costs, and migration trends.

B. Core Economic Forecasting Module

The State and MSA models are econometric and have a quarterly periodicity. Consequently, each model is able to capture the full business cycle behavior of the economy, including the timing and amplitude of the turning points.

Another general characteristic of the models is that they are policy sensitive — they respond to changes in tax rates, military spending, utility costs, etc. There are a number of reasons for this sensitivity, and these will be highlighted in the description below. A few of these reasons are the following:

- Each state is modeled individually, with different model structures specified according to the characteristics of the state
- National policy is explicitly captured,
- The comparative advantage of one state over another is explicitly modeled using relative cost variables.

The three major components of the Global Insight approach are summarized below:

1. The major linkages among the models occur in the economic base or export sectors. These we identify as primarily agriculture, mining, the federal government, and most manufacturing industries. In a few states, banking, insurance, or services (hotels) sectors also can be classified as export sectors. For the most part, these industries serve national rather than local markets or are not dependent upon the local market. On the other hand, the income generated from these sectors provides one of the major stimuli to the local economy. The local growth and decline of these sectors has a lot to do with the economic health of the region.

2. The local economy is composed of construction, transportation, utilities and communications, finance, insurance, and real estate, wholesale and retail trade, services, and state and local government. The major driving forces in this part of the economy are local in nature. The income generated by the export sectors circulates and multiplies through the local economy and generates the greater part of regional employment. These interactions and simultaneities can only be captured in an independent model.

3. In our demographic sector, net migration is driven by economic conditions. The principal assumption here is that people follow jobs and higher incomes rather than vice-versa. This does not mean that nonpecuniary determinants of migration do not exist. However, these are either fixed (climate and landscape) or vary only slowly (urbanization) or are special in nature (the ability to sell homes and retire to Sunbelt areas). The important thing is to provide the correct direction of causality. Demographic factors are most important on the consumption side of the regional economy. They are a significant factor in housing, retail sales, autos, etc., and the relationships are captured in the models. Population is also an important long-term determinant of the size of such sectors as state and local government.

In what follows, each of the three major sectors introduced above (export economy, local economy, demographics) is discussed separately. The key income sector is when described, followed by the housing and consumption sectors. Most of the discussion that follows explicitly refers to our State models, but a similar structure also exists in the metropolitan area models.

1. The Export Economy

A. The Manufacturing Sector

Manufacturing is the predominant export activity for a majority of the states. Consequently, as in previous versions of the Global Insight regional models, this sector is accorded special attention, particularly with respect to the industrial composition in each state. The current version contains

integral quarterly models of employment by 20 two-digit SIC industries, covering all aspects of manufacturing.

The coverage of individual industries is critical to our approach. During nearly every recession, for example, certain sectors are hit harder than others, and each is affected at different points in the cycle. Obvious examples are housing, consumer durables, and business investment. These end uses — to the extent they are supplied from domestic U.S. sources — rather than imports — place heavy demands upon basic industry, i.e. wood products, steel, concrete, aluminum, etc. Therefore, these sectors tend to be more cyclical than the rest of manufacturing. Regions with high concentrations of such industries will quite obviously suffer disproportionately more during recessions and grow disproportionately faster during recoveries.

Of course, each business cycle is unique, with different sectors weakening and recovering at different rates. Some localized recessions can even be quite focused on one industry, such as seen in the effects of falling oil prices beginning in 1983, and subsequent declines in related income components and energy exploration activity. This "energy recession" occurred as most of the nation's manufacturing industries were rapidly climbing out of the long double-recession period of 1979-1982, and was naturally concentrated in the energy-producing regions of the U.S.

In the development of the state manufacturing employment equations, Global Insight has incorporated a number of innovations to enhance the explanatory richness of the equations.

- The equations capture interindustry, interregional, and dynamic linkages by integrating input-output, spatial theory, and econometric concepts.

- The employment equations are estimated using quarterly employment data beginning in 1972. These data cover all two-digit manufacturing sectors across all states, and were derived by Global Insight using data from the Bureau of Labor Statistics (ES-202 and 790 survey data), the Bureau of Economic Analysis, and the Census Bureau. With quarterly data, the equations are able to capture the timing and amplitude of turning points in the business cycle. In addition, at the two-digit level, employment data are the most reliable, accurate, and timely measure of state industrial activity.

- Employment levels are estimated using national and state-specific explanatory variables. Through direct linkages to the national economy we ensure consistency with The Global Insight Group's national forecasts, and we capitalize on the depth of the macroeconomic model and its detailed industrial production sector. By linking the employment equations to the national model, we also have the ability to analyze variations in the impact of Federal policy changes — for example, tax policies and defense spending — across regions and states.

1. The Formulation

The manufacturing employment equation has the following functional form for each two-digit industry in a given state:

EM = f(EMUS, RWJIP, RINTDM, RCOST, LPRM, FINDEM)

where:

EM	=	employment by industry by state
EMUS	=	employment by industry, national
RWJIP	=	industry mix relative to U.S.
RINTDM	=	relative interindustry demand
RCOST	=	costs of doing business, relative to U.S.
LPRM	=	labor productivity
FINDEM	=	final demand factor

The first two terms are the key linkages to U.S. economic activity, and may enter the equation in two ways. First, is the case where U.S. employment by two-digit industry is modified by that industry's mix in the state relative to that in the nation. The second can be interpreted as state-weighted industrial production, modified by national productivity trends in each industry. An explanation of how we measure industry mix, as well as how the components of the equation are constructed is covered below.

2. Industry Mix

The Global Insight two-digit models are affected by the industry mix within categories, a key factor all too often ignored in other models of regional activity. Examples include Aircraft versus Motor vehicles within SIC 37 (Transportation Equipment), or Appliances versus Electronic components within SIC 36 (Electrical Machinery), or Floor coverings versus Fabrics and Yarns within SIC 22 (Textiles). In every analysis undertaken by Global Insight, this detailed understanding of the industrial underpinnings of a state's economy dominates every other factor, and is critical in the analysis of short-term cycles as well as long-term growth. Of course, other factors are also relevant, and these will be discussed in the following sections.

Industry mix effects are captured in the "weighted industrial production index," or WJIP, a concept common to all previous versions of the Global Insight regional models. The difference in the current version is in the use of the index of separate two-digit industry equations rather than for total manufacturing alone. The WJIP is simply a re-weighting of the U.S. indexes of industrial production at the three-digit level, according to the relative importance of industries within the state's two-digit sectors (using employment as weights in most applications).

Localized demand may also be an important determinant of manufacturing activity. Construction activity, a major source of regional final demand, has already been included in the creation of the intermediate demand variable, but local housing markets are often explicitly included in the equation. The impact of the other final demand categories enters the employment equations through three-digit SIC state employment weighted industrial production indices.

At the national level, forecasts for the three-digit JIPs are determined by both intermediate and final demand drivers using a hybrid input-output-based model. For example, the JIP for Transportation Equipment (SIC 37) is determined by consumer expenditures for motor vehicles and parts, imports of motor vehicles and parts, and relative prices. The JIP forecast for nonferrous metals is then derived from the demands from Transportation Equipment and other metal-using

industries. Consequently, any increase in these final demand components flows directly into the state employment equations.

3. Interindustry and Interregional Demand

The third term in the manufacturing employment equation is a measure of demand for an industry's products by other industries. An interindustry, interregional demand term is constructed for every two-digit SIC industry in each state. As computed, the importance to each industry of each geographic market varies according to:

- input-output relationships that quantify demand from 70 key industrial buyers by sector and from selected end-user sectors
- the geographic location of potential markets, measured with employment data
- transportation costs, measured by distance or known trade patterns between states
- strength of industrial demand, measured by the expected growth of manufacturing activity by sector in every state.

These concepts allow the models to respond to such phenomena as:

- the paper manufacturer in Wisconsin facing relatively weak demand when a decline in the auto industry makes the Great Lakes area a weak market relative to the rest of the U.S.;

or

- the steel industry in Texas facing weak oil-related demand, relative to the stronger end-use demand faced by steel producers recovering in the Northeast.

Previous attempts to capture such effects in other regional forecasting systems have resulted in large unwieldy simultaneous models at the state level, or in the necessity to create a separate set of models at the broad region level, despite the wide variance in industry mix among individual states. Global Insight's approach is unique in avoiding these difficulties, while still maintaining the ability to simulate only one or any desired number of states at a time.

4. Cost of Doing Business

The third set of independent variables to enter the employment equations is the relative costs of doing business in each state. Any explanation of regional growth must take into account that there are few barriers to the flow of economic activity across borders. States actively and openly compete for new and expanding businesses which determine economic growth. Since most industrial firms charge the same price for their products, regardless of their place of origin, differences in profitability are tied directly to differences in relative costs. Since greater

profitability means higher returns to capital invested in the region, we expect that the region's share of investment will be inversely related to relative costs.

The major factors affecting relative costs are natural resource costs, unit labor costs, unit capital costs, transportation and distribution costs, energy costs, and unit taxes. Let's examine these one at a time. Because regional **natural resources** are well known and not changing over the historical period, and their costs are difficult to measure in any case, we do not only include mineral resources such as coal or copper, harbors and waterways, land form and climate, and the like. The effect of natural resources is embedded in the estimated equations but does not appear explicitly.

The regional variation in **unit labor cost** is made up of two parts: wage rates and productivity. Productivity is primarily related to the industrial mix and the age of the capital stock. These are not determinants of new investment decisions. Therefore, the wage rate is the important variable. Wage rates do certainly vary by skill, education, and underlying local costs of living. This is captured by defining the relative labor cost variable as the state wage rate relative to the national wage rate weighted by the industry mix of that state. The denominator is weighted in just the same way as national industrial production. For example, if a state is primarily manufacturing textiles, that state's wage rate should not be related to the overall national wage rate but to a weighted average consisting primarily of textiles. The state may have very low wage rates, but if they are in a low-wage rate industry such as apparel, they do not provide the comparative advantage they might in a high-skill high-wage industry.

Unit capital costs of structures are primarily a function of wage rates, in this case in the construction industry. On average, about one-quarter of nonresidential construction costs are accounted for by labor costs. Of the other costs — equipment rental, overhead, and materials — the variation from state to state is mostly short-term related. For example, a study of public works by Global Insight for the U.S. Department of Commerce found that raw materials flows between states are extremely small, accounting for only 5 percent of expenditures on average. Thus, construction materials are produced locally in most states where differences in price are accounted for by labor and energy costs. Therefore, other relative costs can account for regional variations in unit capital costs.

Transportation costs are important for bulk commodities, but less so for manufactured goods with a high value-to-weight ratio. Historically, transportation costs have had the same characteristics as natural resource costs; they were well-known and relatively stable, particularly between regions.

In pure time series, transportation costs do not enter the employment equations significantly, primarily because they are related to average distance to markets that do not vary over time, and because they are correlated with the energy costs variables as described below. However, transport costs do enter the equations via the interindustry demand variable.

Energy costs are natural resource costs which we are often able to include explicitly. Historical time series data are available for electrical power and natural gas costs because of the Federal and state regulations which apply to these industries.

Natural gas costs per BTU by region are measured by the average delivered industrial price. Forecasts of costs are dependent upon assumptions made by Global Insight's Energy group. These forecasts are generated from relationships that account for acquisition and transmission costs, and the different sources and types of natural gas, plus a term accounting for transmission costs (that

vary primarily due to distance from the wellhead). The relative state natural gas cost term is the ratio of state natural gas costs to a comparable national average.

Industrial electric power costs, which are also assumed to adequately proxy oil and coal costs, are measured by the ratio of utility revenues to sales within the region. Forecasts of electric power costs are based on an equation with input costs to utilities as the key independent variable, and are consistent with regional projections made by the Global Insight Energy group. The determination of the input mix used in the generation of electricity is dependent on the projected mix of generating capacity within the region.

The **tax cost** variable is somewhat different from the others in that the variable which we use is not specific to manufacturing. The variable is defined as the ratio of total state and local taxes, personal as well as business-related, to state personal income, relative to the national average of this ratio. This is often referred to as tax load. Numerous studies have shown that business-related taxes are not significantly related to locational investment decisions. However, research undertaken at Global Insight, both cross-sectional and time series, indicates that tax load can be important when taken with other costs. Severance taxes are excluded since they impact only one specific industry and are usually exported to other areas of the country.

B. Other Export Sectors

1. Mining and Agriculture

Aside from manufacturing, agriculture and mining (including Oil and Gas) comprise the primary export sectors in most states. Agricultural employment declines over time for proprietors, although wage earner employment is often trendless and highly volatile. It is forecast exogenously. Agricultural activity, on the other hand, can be highly influential on a state's manufacturing activity. North Dakota, for example, has a food processing industry which is dependent on agricultural performance in the state. We therefore use local crop and livestock cash receipts as a variable in our North Dakota equation.

Whereas agriculture is an example of a nearly perfectly competitive industry with a great deal of regional homogeneity by product, mining is often the other extreme. In nonferrous metals, for example, relatively few companies dominate the market. Therefore, for many states, mining forecasts consist of microeconomic analysis. Mining in general, however, is modeled along the lines of manufacturing since an output measure is often available. Mining employment and certain state manufacturing sector activities are then driven by the output forecast in conjunction with other conventional variables. When output measures do not suffice, real prices (or oil, metal, ores, etc.) are often added to the analysis in order to incorporate expected returns on investment.

2. Federal Government

The Global Insight Regional models separate Federal from State and Local government employment. This distinction is important because of the relative insulation of Federal workers from local economic conditions, and is critical in the District of Columbia and surrounding areas where the federal sector dominates. Forecasts of federal employment are made consistent with national trends and budget appropriations, as well as local population growth.

Military personnel (as opposed to defense and nondefense civilian employment) are not included in the establishment employment totals, consistent with the reported data. However, the presence of military bases are often important economic drivers, so we include military employment in our models.

2. The Local Economy

A. Local Nonmanufacturing Sectors

We have seen how manufacturing, mining, and agriculture — the export economy — produce primarily for national, or at least regional, markets, and provide a source of income for the local economy. Other sources of external funds are Federal Government expenditures, tourism, and certain kinds of banking and insurance transactions, the local economy responds and builds on these external stimulants, multiplying the effect by creating its own demand. This is a key area of simultaneity in the model.

Most of the local economy is captured in the nonmanufacturing sector. The classic examples are construction, wholesale, and retail trade, services, local government, utilities, and the like. These are nearly always support services, providing the necessary infrastructure for the base (export) sectors and the local population. Demographics work in two directions. Migration is drawn toward centers of economic growth, and that same migration is as stimulus to the local economy, creating a demand for services. Migration, therefore, constitutes a powerful feedback mechanism — in-migration further strengthens a growing economy, while out-migration further weakens a declining economy. More will be said about the causes of migration below.

As mentioned above, certain nonmanufacturing sectors, although usually driven by local requirements, can also serve national markets. The best examples are the insurance industry in Connecticut, the banking interests in New York, Chicago and California, and the tourist industry. These exceptions are export sectors in selected states. Where they are export-oriented, these nonmanufacturing sectors are driven by national variables.

B. General Model Structure

The Global Insight state econometric models forecast nine categories of locally-oriented nonmanufacturing:

- Construction
- Retail Trade
- Wholesale Trade
- Transportation, Communications and Public Utilities
- Finance, Insurance and Real Estate
- Health Service
- Business Services
- Other Services
- State and Local Government

Each of these contains a diversified group of sub-industries that vary considerably from state to state. For example, construction employment in energy-producing states is often tied as directly to exploration and development activity as it is to local housing starts. Wholesale trade in farming states is highly dependent on acreage planted and other measures of agricultural activity. TCPU in New Jersey has a large component dominated by AT&T headquarters staff, and FIRE has similar headquarters (i.e. nonlocally-determined) employment in New York and Connecticut. Services in Nevada contain a highly disproportionate number of hotel workers. Finally, state and local government employment is dependent upon tax and other policy decisions made by individual governments. All of these require special analysis and monitoring by our regional analysts; just as in manufacturing, an understanding of underlying structure is critical to making reasonable forecasts.

The generalized structure of the nonmanufacturing equations contains four key factors — measures of activity, a cost term, national conditions of importance to a particular sector, and a measure of the stage of the business cycle. Each of these will be examined in detail below.

Sectoral activity measures are the primary determinants of employment by category. These include real income, population, and export sector activity. The cost term is real wages which captures labor substitution effects. Higher wages obviously lead to lower employment. The third term, national conditions, refers to such factors as credit availability, which can impact local construction or retail trade. The business cycle measure, which is often expressed as unemployment relative to working-age population, reflects the stage of the business cycle. This affects the use of overtime and hiring/firing practices.

1. Sector Activity Measures

One of the most crucial objectives in developing a model of the localized economy is to find a suitable measure of the activities driving a particular sector. This is usually a complex function involving income, export sectors, and demographic trends. It varies according to the particular nonmanufacturing sector being examined.

Real personal income is the most frequently used variable, either alone or in combination with others. It is the best measure of aggregate economic activity at the state level, capturing wages, transfer payments, and nonwage income. Thus, it is a key determinant of the level of services. Through its effect on trade and tax revenues, it is a powerful factor in wholesale/retail employment and government employment. Since these employment categories are major contributors to personal income (through wages), this introduces one of the principal simultaneities in the Global Insight model. Stated another way, personal income is a function of employment, and certain employment categories are a function of income.

Population is another key measure of sector activity. Certain age cohorts, for example, are primary determinants of the level of government services required. Younger age groups require more educational facilities. Older age groups require more medical and other services. Population is also a key ingredient in determining the need for transportation and utilities. In the Global Insight regional models, population and real income often enter in the same equation, measuring different aspects of the need for services or other nonmanufacturing sectors.

In summary, nonmanufacturing employment and income are so closely intertwined that any model which does not treat them simultaneously cannot capture the local economy's short-term behavior. Population is also intertwined with income and employment, but on a longer time scale. The Demographic Forecasting Module will be discussed below.

We have previously discussed how manufacturing and other export sectors drive the local economy. Thus, key export sectors are included wherever they impact the local economy. Manufacturing, for example, is a prime determinant of utilities and transportation employment. In highly industrialized states, it has an effect on almost every nonmanufacturing support sector, In certain western states, on the other hand, it is agriculture or mining which are important export sectors. The appropriate export sector is explicitly represented in the equation, and in this way, the second effects of a new plant, a new mine, or increased acreage is directly captured in the nonmanufacturing sectors. Since nonmanufacturing has explicit feedbacks unto itself, the third and fourth order effects are also captured. It is a truly dynamic and policy sensitive equation structure.

2. Labor Costs

When real wages are high and/or rising rapidly, then the tendency of business, government, and other organizations is to hold employment down as much as possible. The reverse holds true when real wages are low or falling rapidly. In the manufacturing sector, wage costs were shown to be one of the principle determinants of business location decisions. In the nonmanufacturing support sectors, this is reflected in the level rather than the location of employment. Thus, employment is inversely proportional to real wage costs. Real wages enter many of the nonmanufacturing employment equations. For forecast purposes, this wage rate is related to the appropriate national variable and the growth rate of the sector itself.

3. National Conditions

The national economy is reflected in three areas in the nonmanufacturing sectors. First, certain macroeconomic conditions affect local activity significantly, even nonmanufacturing. The best example of this is credit availability. Tight credit conditions with high interest rates have an adverse impact on local construction activity, sales of autos, and other durable and the like. Thus, when money is tight, employment in construction an in wholesale and retail trade is adversely affected. The opposite holds true during periods of easy money and low interest rates.

The second class of national variables are those which reflect nationwide trends. An example of this is the trend towards an increasingly larger services sector. Capturing this secular trend is sometimes difficult when one uses only local variables in the nonmanufacturing equations. Thus, the usual assortment of local variables — income, populations, wages costs, etc. — is sometimes supplemented by the ratio of sector employment to total employment at the national level. This is not a "shift-share" relationship. It is used to supplement, not supplant, local activity variables. The elasticity on the national series is uniformly lower than the elasticity on the local variables, and it is simply reflecting gradual long-term changes in the nation's employment structure. The local variables remain the main drivers of the local economy.

The third application of national variables is to the export-oriented nonmanufacturing sectors, such as the insurance and banking industries in certain states. The New York, Chicago, and California

banking sectors respond to national markets rather than depending heavily on local markets. In states where tourism is a significant factor in generating services employment, such as Hawaii, more national variables enter the nonmanufacturing equations. This is not to say that tourism is explicitly captured. Econometric modelers of all types have yet to properly capture tourism in their models, partially due to the lack of good data. At Global Insight, we capture tourism in those states where it is important by including more and more heavily weighted national variables and national ratios. The rationale for this is the propensity for tourism to follow the national business cycles or nationwide phenomena such as gasoline prices and availability.

4. Business Cycle Timing

A cyclical variable which measures the state of the national business cycle is usually included with each nonmanufacturing sector. The purpose of this variable, which is the employment rate or capacity utilization, is to the capture the hiring/firing cycle. As the local economy slides into a recession, employers are reluctant to lay off workers until necessary. It is costly to dismiss and then re-hire employees, and it is usually difficult to tell whether a recession is really coming in the early stages of a downturn. Conversely, as the economy pulls out of a recession, employers are reluctant to hire new employees until the recovery is clearly underway. Thus, there is a clear lag between the behavior of the activity variables, such as income or export sector employment, and the behavior of employment in the nonmanufacturing sectors. Many sectors have a cyclical variable in the specification to capture this lagged effect.

3. Personal Income

A. Background

The complex structures and feedback loops contained in the state export sectors, local economy sectors, and demographic formulations are designed to meet three key objectives. The first is to capture the complex interactions between the various sectors, allowing the most sophisticated policy analysis possible. The second is to provide consistent forecasts of output and employment by sector, which are key statistics for many business and government applications. The third is to produce accurate forecasts of personal income because of its important to the whole state economy.

Personal income is most the frequently updated and the best overall measure of activity within a state, capturing labor income, property income and transfer payments. Good employment forecasts are critical to a good forecast of personal income since wages and other labor income constitute over 70 percent of income. In addition, there are multiple feedbacks between various employment sectors, cost variables, income, and population.

Global Insight forecasts sixteen categories of personal income in the following groupings both in constant and current dollars.

- Total Personal Income by Place of Residence
- Disposable Personal Income
- Manufacturing Wages
- Nonmanufacturing Wages by Sector
- Other Labor Income

- Farm Proprietors' Income
- Business Proprietors Income
- Transfer Payments
- Contributions to Social Insurance Programs

It is important to note that many of the minor income sectors, which in total account for less than 30 percent of personal income, are forecast using national variables, There is one overwhelming reason for this — the data. As long as reported data are basically shared from national totals, the forecast equations will rely heavily on national variables for the minor income sectors. This weakens somewhat, but certainly does not invalidate the independent nature of each state model, the basic reliance on local variable, and the various feedback mechanisms.

B. Wages

Compared with most factors of production, there is mobility in the labor market. Consequently, we expect the real wage to be similar across the United States, and nominal wages should increase with the local price level. From the demand side, we expect real wages to vary directly with labor productivity and with state manufacturing output relative to the United States. Finally, in the short-term, the unemployment ratio to population will affect the average wage rate.

In order to model manufacturing wages, we explicitly account for the industry mix in the state, as well as the differences in wages per employee between industries as experienced by the state. To accomplish this, a variable called "generated wages" was calculated. The generated wage bill used in the manufacturing wage bill relationship is the sum of locally weighted national hourly earnings at the two-digit SIC level. Since the two-digit manufacturing employment relationships are endogenous, the weights in the generated wage bill for manufacturing change as the composition of manufacturing employment changes at the state level. Also, as is the case in the Private Service Producing and Construction/Mining equations, a labor market tightness variable (usually the ratio of unemployment to working-age population) is included in some of the equations as a local modifier.

There are four stochastic relationships for components of the total wage bill in each state model. The endogenous components of the wage bill are Private Service Producing, Construction and Mining, State and Local Government, and Manufacturing. The Federal Government is exogenous.

The structure of the wage bill equations for Private Service Producing and Construction/Mining are identical. In each of these sectors, a "generated" wage bill and a labor market tightness variable are used as independent variables in the relationships. The generated wage bills are equal to the wage bill to be expected by employees in each industry in the state had they been paid at the national industry rate. The labor market tightness variable is defined as the relative ratio of the number of unemployed persons per capita in each state to that in the nation, and it acts as a local modifier to the generated wage bill term.

The State and Local Government wage bill equation explains compensation per employee as a function of the compensation rates in Private Service Producing industries.

C. Other Income Components

Taking each non-wage income category in order, other labor income is tied to the size of an individual's wages since it represents employer-paid benefits. It is evident that a properly specified equation for this variable must include total wages and salaries. Further, we know that this is an income category which is increasing at a faster rate than total wages as a result of trends in nonwage compensation and medical care costs. To capture this effect, a variable representing the national ratio of other labor income to total wages and salaries is added to the equation.

Business proprietors' income is a category which is frequently specified incorrectly in regional models because of the failure to include both national and regional variables. Most unincorporated businesses depend heavily on local activity. To capture this effect, regional personal income less business proprietors' income is included in the specification as a general indicator of regional activity. It is also necessary, however, to include variables that capture the effects of activity in other regions and changes in national economic conditions (such as revisions in tax codes) that affect profitability. National business proprietors' income serves this requirement.

Farm proprietors' income by state from the BEA is of notoriously poor quality and is not consistent with even the most carefully constructed farm data as prepared by Global Insight's Agriculture Group. For nearly all states, we have found that deflated cash receipts rather than net income in agriculture is a much better indicator of local demand conditions. The state-level mix of agriculture activity is available from Global Insight's Agriculture Service and is input into the state models as exogenous variables where appropriate. Farm proprietors income is about 1 percent of total income in most states.

Because the bond and equity markets are national in nature, we have found that property income is best specified using national variables. specifically. We include both interest and rental income and dividends in the equation. Property income is 18 percent of national income.

Virtually all income transfer programs are either Federally administered or Federally funded. They are dominated by the Social Security Program resulting in nearly identical movements of transfer payments across regions. Transfer payments are 15 percent of personal income.

The last category of income is personal contributions for social insurance programs, primarily Social Security. These payments are obviously a debit to personal income since they are already included in wages. The impact of Federal regulation on expenditures in this category is much the same as it is on transfer payments. However, we do not use the national totals for this income components directly as an explanation of its regional counterpart. We compute instead an implicit rate of taxation by including the ratio of national social insurance contributions to national wages and salaries along with total regional wage income, In this way, contributions vary directly with changes in tax rates or local wages and salaries.

4. Residential Construction

Housing starts is one of the most complex regional variables to forecast. There are two reasons for this — a lack of data and the nature of the industry. No state-by-state figures on housing starts are available, but rather only permit data. These permit data usually cover only a portion of each state, i.e. "permit issuing places." Thus, historical data on housing starts by state must be estimated from

limited coverage permit data. This is an inexact process which can only be verified in Census years.

The second problem is that housing starts are extremely volatile, responding rapidly to interest rates, credit availability, changes in vacancy rates, strikes, usury ceilings, weather, and other factors. Since the number of starts is an addition to the housing stock, forecasting housing is analogous to predicting the change in employment rather than the level. The apparent error is magnified.

The appropriate specification of the housing equation is a stock adjustment equation where the desired stock is essentially the desired number of households. The desired stock is determined from the size of the number and age distribution of households, permanent real income, and unit prices. Since population by age group is the key long-term, determinant of the number of households, there is a natural consistency between housing starts and long-term economic growth in each state.

C. Demographic Forecasting Module

1. Population

Although the trend has slowed recently, Americans have been leaving the North and East for the past two decades. Their migration south and westward has meant rapid population growth in these areas and stagnant or declining population in many of the older industrial states. This population shift is related to relative economic opportunity and other factors. The purpose of the Global Insight state population model is to capture this dynamic relationship between population and the economy while capturing demographic factors through "cohort-component" techniques.

Population change at the state level is made up of:

- Births
- Deaths
- Net migration

During the 1970s, natural increase has accounted for 68 percent of population growth nationwide, but in a number of fast-growing states in the South and West, net migration accounted for over half of the gain, making interstate mobility an important determinant of state population growth. Global Insight's econometric analysis of net migration based upon economic determinants differentiates its forecasts from the Census Bureau's trended state projections.

Migration flows between the states are the result of individual decisions which we have viewed as responsive to economic opportunities. Net migration, the difference between immigration and outmigration, has been modeled in rate form as the outcome of each state's economic performance relative to that of the nation.

The demographic factors in population change are built into the model through the use of "cohort-component" techniques. This method projects a given population by applying age and sex-specific rates of fertility, mortality, and migration. Birth, death, and foreign immigration rates are based upon the Census Bureau's "Middle Series" projections, adjusted for interstate differences. Because considerable age and sex detail is maintained over the projection period, the model reflects the

sensitivity of population change to variations in age structure and permits analyses of the relative roles of natural increase and migration. The use of age-specific rates allows the distinction to be made between, for example, population growth due to increased birth or survival rates and that due to a change in the age structure, even though the rates at each age may remain constant.

In order to fully exploit economic-demographic linkages, Global Insight has developed a quarterly population sector within each core model. This system simultaneously determines population for eight age groups and economic activity. Birth rates, death rates, and graduation rates, used to survive the population from one age group to the next, are derived from the results of annual models containing detailed information by single year of age and sex. The models are run periodically to incorporate newly available demographic information, and data used by the state quarterly models are updated accordingly. In the following section, we describe the manner in which each of the three components of population change are measured.

A. Births

One of the most significant demographic developments of the past decade was the dramatic drop in the national birth rate. Although U.S. fertility patterns have been characterized by long, regular cycles, there are indications that the most recent downturn reflects structural as well as temporal changes which are likely to reduce the amplitude of future cycles.

The Census Bureau's middle series projections predict only a slight upswing in the total fertility rate during the second half of the 1980s, consistent with social and economic trends which tend to force participation, increases in educational attainment, and a higher age at first marriage. These trends have been verified by recent fertility levels and women's expectations of future births.

While these projections appear to be reasonable as a starting point, there is a substantial degree of variation among state fertility rates. Consequently, the projected national fertility rates are adjusted to reflect the historical relationship between each of the states and the nation.

In order to forecast state births, a crude birth rate is calculated based upon these detailed fertility rates. The rates are updated periodically as new state fertility information becomes available.

B. Deaths

The differences between the states in life expectancy at birth and in the age-sex structure of survival rates are marked enough to advise against the use of a single set of national survival rates as is generally done. The mortality component of the Global Insight state population model takes account of these differences by applying age and sex-specific adjustment factors for each of the states as they relate to the national survival rates projected by the Census Bureau.

These adjustment factors were calculated as the ratio of state to national birth rates in 1980 as reported by the National Center for Health Statistics (NCHS).

2. Net Migration

The economic explanation of regional migration is that labor will move from low-wage, less-developed areas to where wages are higher and economic opportunity greater, while firms will tend to locate facilities where profit opportunities are the greatest. In practice, the relationship between migration and regional economic development is somewhat looser. People often prefer present family and social ties to the uncertainties of other places. In periods of slack national economic activity, mobility generally declines as people are less willing to chance a move and as businesses reduce the number of employee transfers. And, of course, some migration responds to noneconomic incentives such as a more pleasant climate.

Nevertheless, a good part of the migration pattern of the United States has reflected the movement of people to areas of greater opportunity. Historically, this has meant migration from the agricultural, low-wage areas of the Middle West and South to the developing urban-industrial centers of the Far West, North, and East. Since the late 1960s, however, there has been a dramatic reversal of this traditional migration pattern and a redistribution of population away from the older industrial regions toward the burgeoning centers of the South and West.

This change of direction in migration flows is related to the same factors which have stimulated economic growth in the Sun Belt states. Regional differences in employment opportunities, real per capita income, and housing costs, together with changes in technology and in the structure of the national economy, have conferred substantial locational advantages to these newer economic growth centers. Migration has followed suit. In areas like the Southeast and Southwest, once subject to a chronic population drain, employment has grown fast enough to draw in considerable numbers of newcomers, as well as to provide jobs for local residents (though this is threatened in some states by continuing weakness in energy industries). In contrast, much of the slower growing North and East has been unable to attract enough migration to balance substantial population outflows.

Although there has always been some disagreement as to the effect of migration flows, it is probably fair to say that the dominant view is that migration tends to narrow the economic gap among regions. In our review of the migration trends of the past ten years, we find that it is rapid economic growth which creates net in-migration. As we have already mentioned, however, the inflow of people is itself a stimulus for further economic growth by creating a greater demand for services, housing, etc., and by enlarging the labor pool. The process works in reverse where there are net outflows.

These reinforcing effects of migration and economic growth provide reason for expecting further regional convergence. It is, after all, the less-developed but high-growth areas which are attracting migration. Their rapid growth continues to bring about a narrowing of regional economic disparities.

A. Data

Unlike births and deaths, which are carefully tracked by the NCHS, reliable, consistent migration data are not readily available. Historical data derived as the residual of the previous period's population and net natural increase suffer from three major shortcomings. First, net migration is not surveyed directly by the Census Bureau; rather, it is estimated using a combination of statistical techniques.

The second source of error is the Census Bureau's method of adjusting post-censal population estimates to be consistent with the subsequent Census. The difference between the 1980 estimate of population and 1980 Census count, for example, was distributed linearly to each of the years 1971-79. Since births and deaths are known, by failing to recognize the existence of an undercount in 1970, this procedure attributes all of the intercensal "error" to the net migration component.

Third, the calculation of state net migration by age is distorted by the Census Bureau's method of estimating post-censal population. In order to avoid continuing age group distortions resulting from Census year undercount, the Census Bureau inflates base year population by age and sex to include estimated undercount prior to calculating births and deaths over the year. The resulting survived population is then deflated to a level consistent with the official census estimates. Although this algorithm called "inflation-deflation" is implemented only at the national level, the process of adjusting state population to sum to national totals distorts net migration by age.

As a result of these problems, we have reconstructed 1970/80 state and national population estimates based upon recently released and unpublished Census Bureau data on population corrected for undercount. From these new estimates, we have calculated revised net migration series which we believe are less biased than the Census Bureau's series. Net migration by age is forecast based on a fixed age distribution derived form 1980 census data on place of resident in 1975, eliminating the problem of differential undercount.

In order to make the population series as useful as possible, the Census Bureau's 1971/79 total state intercensal population estimates are maintained on regional data bases. Since the Census Bureau did not revise its post-censal estimates of state population by age, additional estimation work was performed to yield age detail consistent with both the 1970 and 1980 Censuses. Unpublished Census Bureau estimates of state population by age for 1980 were compared to the corresponding Census count to create adjustment factors which were then linearly applied to the post-censal estimates. An interactive procedure was used to insure that the sum of population by age within each state equals both the total intercensal population estimate and that the state population sums to the Census Bureau's revised estimates of national population for each age group. For the years subsequent to 1980, net migration data are derived from the basis population identity.

NET MIGRATION = POPULATION(t) - POPULATION(t-1) - BIRTHS + DEATHS

B. Forecasting Net Migration

We have hypothesized that interstate migration is related to regional disparities in economic activity so that, for example, states with rapidly growing employment can be expected to attract a new inflow of migrants. To reflect this view of migration, the annual net migration rate for each of the states has been modeled as a function of relative economic performance as follows:

$$\frac{\text{Net Migration}}{\text{Lagged Population}} = f(\text{change in relative employment or relative unemployment rates, relative real per capita income, relative housing costs, housing market activity})$$

All explanatory variables are lagged to reflect the decision period for making a move.

As was mentioned above, relative employment or unemployment rates measure job opportunities, while relative real per capita income measures differences in the standard of living across states. A potential, migrant with job opportunities in more than one state is likely to be influenced by housing cost differentials as measured by the actual price of existing single-family homes and/or the state's rental cost index relative to the nation's. Housing market activity, as measured by starts and sales, is used as a friction term. When houses are difficult to sell, people are less likely to move. Conversely, in a boom period, the ease of selling one's house encourages a move.

The age distribution of net migration is held fixed throughout the forecast period. Weights are derived from data obtained from the 1980 Census on place of residence in 1975. The simulation of each state model involves the calculation of a calibration constant which insures that net migration rate estimated stochastically. This method acknowledges the fact that age-specific flows within a state can be in opposite directions.

D. Summary

The following chart summarizes the flows between the various sectors of the Regional and Macroeconomic models. Briefly, the U.S. macroeconomic forecasts and the forecasts of related services such as international, energy, agriculture and the consumer sector serve as the basic drivers for the Regional Core forecast. These forecasts, in turn, provide the foundation for the other regional forecasting services such as Regional Industry, Real Estate and Construction and Regional Financial. Together, the inter-relationships provide a dynamically consistent modeling system that preserves the basic assumptions underlying each forecast.

The key linkages within the Regional Core forecasting block can be unraveled in a straightforward manner. The basic starting point is the Export sector. There are 23 industries in this sector, in manufacturing, mining, agriculture, and Federal government. Local employment is not usually directly affected by the export sector (except in special cases such as agriculture's effect on wholesale trade in some states), but rather is connected via current and lagged personal income.

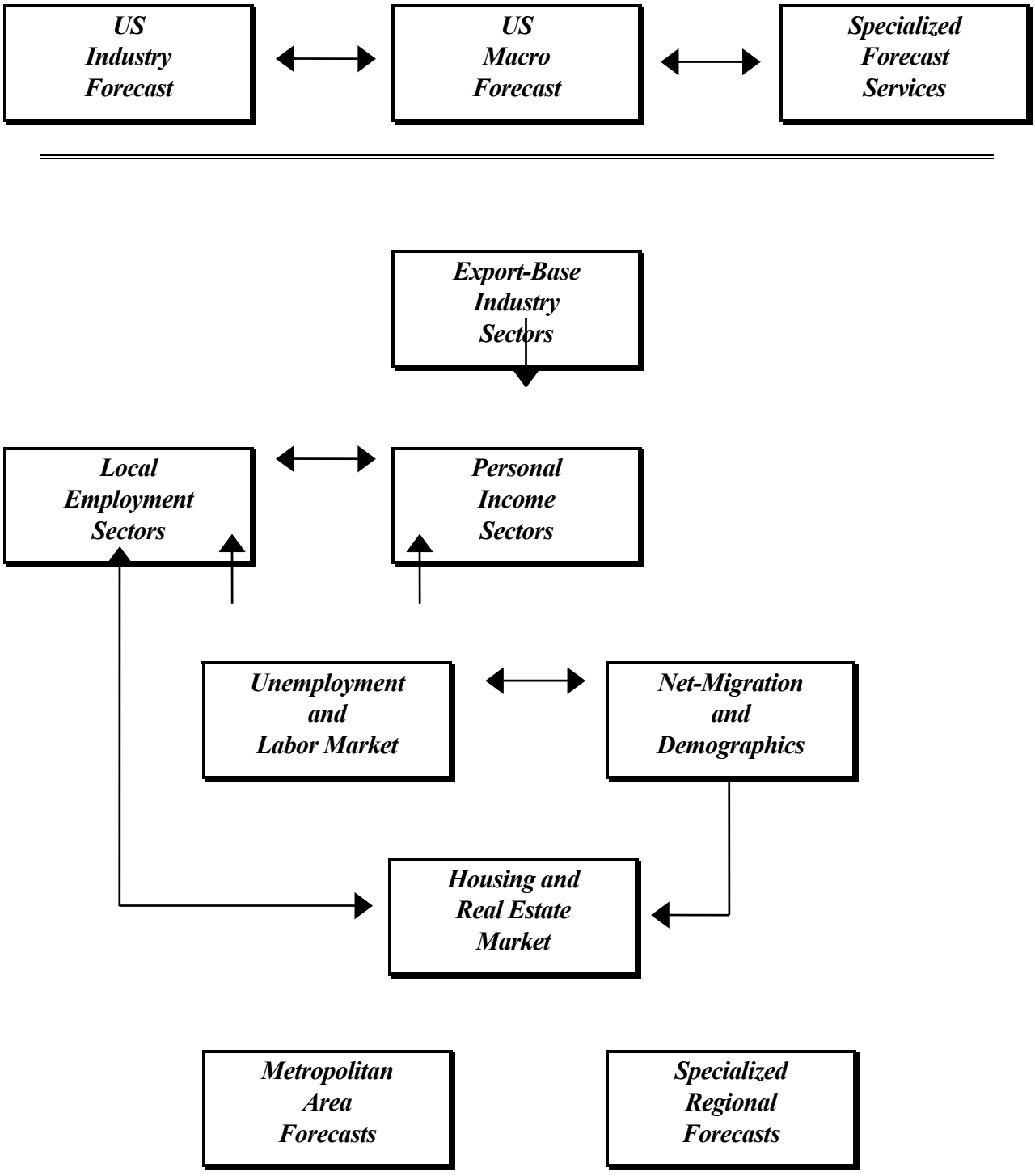
After wages are determined for each industry group, the model calculates categories of personal income that depend upon wages or simultaneously upon income. A "residence adjustment" to income is made to account for workers who work in one state but live in another. At this point the federal income tax liabilities are calculated using effective rates of tax that vary from state to state; the rates vary primarily because of differences in per capita income and the progressive nature of the federal tax system. State and local personal taxes and fees are calculated in a similar manner. After-tax or disposable income is the result of the calculation, and is the primary explanatory factor in the nonmanufacturing (local) employment equations. This closes the major simultaneous block in the state model.

Also simultaneous with employment determination is the demographic/housing block. Net migration in each state is usually determined by job growth or unemployment rates relative to the nation or to other states. State population growth by age group is then determined by adding net migration and net births to last period's population. Household formation, a key determinant of housing demand, is calculated by applying age-specific "headship rates" to population. Single family and multi-family housing starts which are forecast as a function of household formation, the

stock of housing units, housing prices, income, credit conditions, and national housing trends, then are important determinants of construction employment.

The number of unemployed relative to working-age population in each state (the unemployment ratio) is explained by local employment and population growth and national unemployment patterns. This unemployment ratio, which is much more stable than published state unemployment rates, is used as an explanatory variable in many of the model's wage equations.

Chart 1: *Regional Model Structure*



COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF TELECOMMUNICATIONS AND ENERGY

FITCHBURG GAS AND ELECTRIC LIGHT COMPANY
2003 INTEGRATED GAS RESOURCE PLAN
Docket No. D.T.E. 03-52

COMPANY'S RESPONSES TO THE DEPARTMENT'S RECORD REQUESTS
January 22, 2004 Hearing

DTE-RR-3 Please provide an explanation for the decrease in residential customers after 1990 along with any associated analyses or reports that may have been prepared.

Company Response:

FG&E has previously responded to this question in response to data requests DTE-1-14 and DTE-2-13. As previously stated, FG&E does not know the precise cause or causes of the decrease in residential customers after 1990. However, as described in prior responses, FG&E expects the likely reasons for the customer decrease are associated with (1) customers turning to heating oil during periods when home heating oil was cheaper than natural gas, and (2) retirements of inactive services and meters by FG&E during the early 1990s.

The chart below displays the nominal price FG&E charged its residential gas customers ($/mmbtu) versus the nominal state-wide price of home heating oil ($/mmbtu). The years 1985, 1990 and 1995 are marked to isolate the late 1980s and the early 1990s. The year 2002 is marked to denote the beginning of the forecast data. The chart indicates that home heating oil was less expensive than natural gas during the late 1980s and again during the early 1990s. This price advantage may have caused some customers to switch from natural gas service to home heating oil during these periods.

FG&E's customer count is based on meter counts. Currently, FG&E's meter counts do not include inactive meters. However, if the meter counts during the 1980s and early 1990s included inactive meters, FG&E might have lost customers due to fuel switching during the late 1980s and this activity would not have been reflected timely in the meter counts. In the 1990 timeframe, stricter regulations were implemented that reduced the time services and meters could remain inactive before they must be removed. As FG&E implemented these new regulations over the course of the early 1990s the number of inactive meters would have dropped. If inactive meters made up a portion of the meter count, this would have been reflected as a drop in the customer count data.

FG&E does not have any other analyses, reports or formal studies that attempt to explain the decrease in residential customers after 1990.

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF TELECOMMUNICATIONS AND ENERGY

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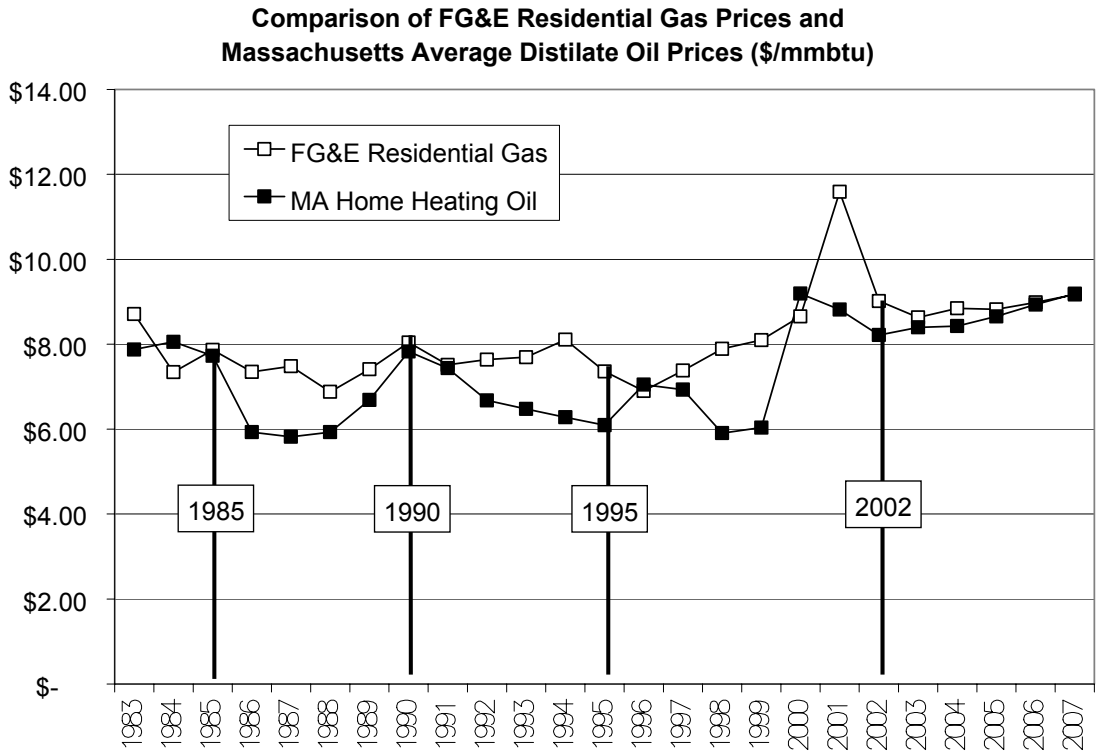
COMPANY'S RESPONSES TO THE DEPARTMENT'S
RECORD REQUESTS
January 22, 2004 Hearing

Response to DTE-RR-3
(cont.)



Person Responsible: Robert S. Furino

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF TELECOMMUNICATIONS AND ENERGY

FITCHBURG GAS AND ELECTRIC LIGHT COMPANY
2003 INTEGRATED GAS RESOURCE PLAN
Docket No. D.T.E. 03-52

COMPANY'S RESPONSES TO THE DEPARTMENT'S RECORD REQUESTS
January 22, 2004 Hearing

DTE-RR-4 Please provide the figures for EDD and HDD for the extreme cold snap that occurred for the ten day period around January 16 along with graphic comparisons of the EDD and the HDD for this period.

Company Response:

The following table and chart present and depict the EDD and HDD experienced during the ten day period around January 16, 2004.

Worcester-Bedford Data

Date	EDD	HDD
1/11/04	50	46
1/12/04	42	39
1/13/04	63	53
1/14/04	71	65
1/15/04	80	68
1/16/04	68	56
1/17/04	42	38
1/18/04	45	40
1/19/04	58	50
1/20/04	58	50
1/21/04	51	48

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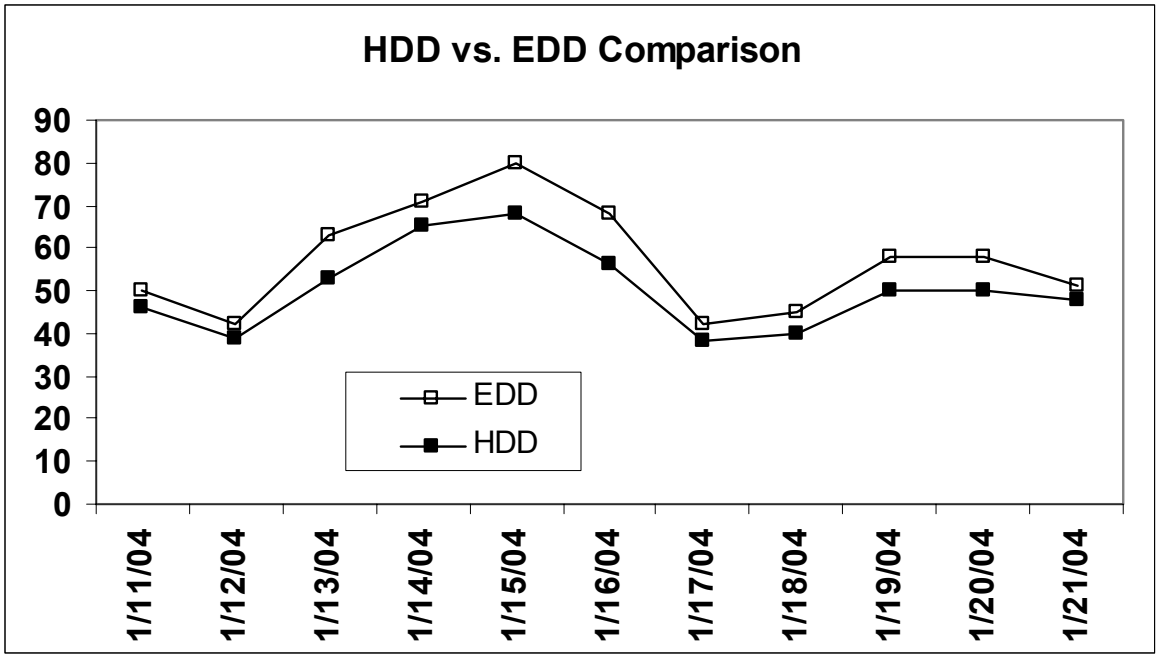
COMPANY'S RESPONSES TO THE DEPARTMENT'S
RECORD REQUESTS
January 22, 2004 Hearing

Response to DTE-RR-4 (cont.)



Person Responsible: Richard MacInnis

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF TELECOMMUNICATIONS AND ENERGY

FITCHBURG GAS AND ELECTRIC LIGHT COMPANY
2003 INTEGRATED GAS RESOURCE PLAN
Docket No. D.T.E. 03-52

COMPANY'S RESPONSES TO THE DEPARTMENT'S RECORD REQUESTS
January 22, 2004 Hearing

DTE-RR-5 Is there a weather station in the FG&E service territory that would be more accurate than the Worcester and Bedford weather stations?

Company Response:

Based upon information FG&E has obtained to date, there is not a weather station in the FG&E service territory that would be more accurate than the Worcester and Bedford weather stations. This conclusion is based on a number of considerations, including the expected reliability and accuracy of data, duration of available historical data, comparability of elevation, and proximity to the service territory.

Below is a table of weather stations in the vicinity of FG&E's service territory. Of the stations listed, only Fitchburg Municipal Airport is located within the service territory. The National Climatological Data Center includes Bedford Hanscom Field, Fitchburg Municipal Airport and Worcester Regional Airport on its list of First Order weather stations. First Order stations are generally operated by the National Weather Service (NWS), U.S. Air Force (Air Weather Service), U.S. Navy (Navy Weather Service), or the Federal Aviation Administration (FAA) and are usually fully instrumented and therefore record a complete range of meteorological parameters. Weather stations that utilize weather sensing machines to provide continuous data recording of meteorological measures are called Automated Surface Observation Stations (ASOS). Weather stations that are maintained by volunteer observers are called Cooperative stations.

Fitchburg Municipal Airport is an ASOS station and is located within the FG&E service territory, however, it does not have a significant history of data. As the table shows, Fitchburg Municipal Airport began operating as an ASOS station in 1997. Cooperative station data were recorded at Fitchburg Municipal Airport from 1950 to 1962. Cooperative station data were also recorded at other locations in Fitchburg, however a consistent set of reliable data are not available for a long enough historical period for the purposes of long term resource planning. An appropriate historical period should include at least 30 years. Consistent with the lack of significant history, the NWS did not publish station normal data for Fitchburg Municipal Airport in the most recent publication of station normal data for the period of 1971-2000.

Response to DTE-RR-5 (cont.)

FG&E also looked at Ashburnham and Lowell as possible sources of data that might be closer to FG&E's service territory. These stations do have significant histories as shown in the table. In the most recent publication of station normal data, the NWS published normal data for these stations for the period of 1971-2000. It is unclear whether complete histories are available for these weather stations so that design conditions could be calculated. However, as cooperative stations, even if the complete histories are available, FG&E would prefer to use the higher quality data from the Worcester and Bedford weather stations.

These stations are also more divergent in terms of elevation from the City of Fitchburg than Worcester Regional Airport and Bedford Hanscom Field. The City of Fitchburg has an elevation of 482 feet. Ashburnham, at 1100 feet, and Lowell, at 110 feet, are quite different than the City of Fitchburg.

Worcester Regional Airport and Bedford Hanscom Field each have lengthy and reliable historical data. The availability of historical data allows for appropriate calculation of normal data for these weather stations as well as the calculation of design conditions. In terms of elevation, the average elevation of Worcester Regional Airport and Bedford Hanscom Field is 560 feet. This average elevation is closer to the elevation of the City of Fitchburg (482 feet) than Fitchburg Municipal Airport (350 feet). In terms of weather data, comparability of elevation can have a much larger impact than proximity. FG&E believes the average proximity of Worcester Regional Airport and Bedford Hanscom Field, being approximately 15 miles, is acceptable given the comparability of the average elevation. Finally, the strong correlation found over the past three years between HDD data collected by FG&E at its facility and the Worcester-Bedford HDD data presented in DTE-RR-6 supports the continued use of the Worcester-Bedford HDD.

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Response to DTE-RR-5 (cont.)

Weather Station	Station Type	Period of Record	Elevation	Proximity to Fitchburg
Ashburnham	Cooperative	01 Jun 1948	1100 feet	2.9 miles
Bedford Hanscom Field	ASOS, FAA, manned	01 Sep 1942	133 feet	16.6 miles
Fitchburg Municipal Airport	ASOS, FAA, unmanned	17 Sep 1997	350 feet	2.1 miles
Lowell	Cooperative	01 Jun 1948	110 feet	13.6 miles
Worcester Regional Airport	ASOS, NWS, manned	01 May 1946	986 feet	13.4 miles

* Period of Record does not necessarily mean data is available for the entire period listed.

Person Responsible: Robert S. Furino

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DTE-RR-6 Has any weather data, specifically temperature and wind chill, been collected by FG&E that can be compared to the Worcester-Bedford weather data?

Company Response:

Yes. FG&E collects temperature data at its own facility and calculates HDD which can be compared to the Worcester-Bedford HDD data. FG&E does not however collect wind speed data and therefore cannot calculate wind chill effects associated with EDDs. A tabular comparison of the HDD data from Worcester-Bedford and the HDD data collected by FG&E is presented below for the three-year period of January 2001 through December 2003. On a monthly basis (36 observations), the two sets of data are correlated 99.90%; and on a daily basis (1095 observations), the two sets of data are correlated 99.26%.

In line with comments made in the response to DTE-RR-5, the strong correlation between FG&E's own collected HDD data and the Worcester-Bedford HDD data should be viewed as supporting the relevance of the Worcester-Bedford data to FG&E's system. This is not evidence that FG&E should begin using its own data collection for resource planning purposes since no significant history exists and since the data collection methods are not as accurate and reliable as those used by Worcester and Bedford

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Response to DTE-RR-6 (cont.)

Comparison of HDD as Reported by Worcester-Bedford and as Recorded at FG&E, 2001-2003

	Worcester-Bedford			FG&E Company		
Month	2001	2002	2003	2001	2002	2003
Jan	1229	1013	1447	1232	1001	1423
Feb	1079	926	1214	1059	907	1180
Mar	1050	909	924	993	853	918
Apr	547	538	663	531	501	631
May	272	330	342	230	288	300
Jun	43	126	106	33	102	69
Jul	35	16	6	22	18	5
Aug	2	37	15	1	23	13
Sep	131	93	107	114	67	91
Oct	399	561	500	383	537	488
Nov	603	816	685	619	770	701
Dec	941	1145	1040	941	1091	1057
Ann	6331	6510	7049	6158	6157	6876
Win	4902	4809	5310	4844	4621	5279
Sum	1429	1701	1739	1314	1535	1597

Person Responsible: Robert S. Furino

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Response to DTE-RR-6 (cont.)

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Person Responsible: Robert S. Furino

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DTE-RR-7 Has the Company or Global Insights performed a backcast to verify the 2002 independent variables forecast by Global Insights?

Company Response:

The Company has not performed a backcast to verify the 2002 independent variables forecast by Global Insight. As discussed in response to DTE-RR-1, at the time the analysis for the updated filing was prepared the only actual 2002 data available were for energy prices. FG&E is not aware of whether Global Insight has performed such a backcast, but presumes the ongoing maintenance and calibration of their various modeling systems would provide such a function. FG&E is not contractually entitled to any such backcast results.

Person Responsible: Robert S. Furino

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DTE-RR-8 Please explain how the Worcester-Bedford data is utilized in developing HDD and EDD data?

Company Response:

FG&E receives HDD and EDD data directly from its weather service provider for both the Worcester and Bedford stations. FG&E takes a straight average of the HDD and EDD data from the two stations to calculate the Worcester-Bedford data. Thus, the formulas used are:

$$HDD_{Worcester\text{-}Bedford} = (HDD_{Worcester} + HDD_{Bedford}) / 2$$

and

$$EDD_{Worcester\text{-}Bedford} = (EDD_{Worcester} + EDD_{Bedford}) / 2$$

FG&E's weather service calculates HDD and EDD for each station as follows:

HDD = 65 – Average Daily Temperature

and

EDD = HDD * (1 + (Average Daily Wind Speed/100))

Thus, for example, if the Average Daily Wind Speed equals zero MPH, then the EDD and HDD would be equal. Alternatively, if the Average Daily Wind Speed equals 20 MPH, then the EDD would be 20 percent higher than the HDD.

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DTE-RR-9 Can EDD data be obtained from any other source for the FG&E service area?

Company Response:

With the exception of the Lowell station, which FG&E was unable to verify, FG&E has verified that wind speed data are collected at all of the weather stations listed in the table presented in DTE-RR-5. With wind speed and temperature data, as illustrated on DTE-RR-8, one can calculate EDD. Although wind speed data are collected at these stations, the historical availability of the wind speed data for the cooperative stations is not known.

Person Responsible: Robert S. Furino

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DTE-RR-10 Please provide in as much detail as possible the up-to-date costs associated with this filing.

Company Response:

For billings through December 2003, the Company has incurred the following costs:

Unitil Service Corp.:	$ 54,616
Outside Legal Services:	$ 73,645
Outside Consulting Services:	$ 16,058
Professional Data Services:	$
Publication fees:	$ 618
Total:	

Person Responsible: David K. Foote